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A MANUAL

OF

OBSTETRICS.

BY

A. F. A. KING, A.M., M.D.,

PROFESSOR OF OBSTETRICS AND DISEASES OF WOMEN AND CHILDREN IN THE MEDICAL DEPARTMENT OF THE COLUMBIAN UNIVERSITY, WASHINGTON, D. C., AND IN THE UNIVERSITY OF VERMONT; PRESIDENT (1885-86) OF THE WASHINGTON OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY; FELLOW OF THE BRITISH GYNÆCOLOGICAL, AND OF THE AMERICAN GYNÆCOLOGICAL SOCIETIES; ONE OF THE ATTENDING PHYSICIANS TO THE CHILDREN'S HOSPITAL, AND CONSULTING PHYSICIAN TO THE WOMAN'S DISPENSARY, WASHINGTON, D. C., ETC.

WITH ONE HUNDRED AND TWO ILLUSTRATIONS.

THIRD EDITION.

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DESIGNED IN PARTICULAR FOR

MY OWN STUDENTS,

IN THE

MEDICAL CLASSFS OF THE COLUMBIAN UNIVERSITY,
WASHINGTON, D. C.,

AND THE

UNIVERSITY OF VERMONT

TO THEM

This Book

IS AFFECTIONATELY DEDICATED,

WITH THE

EARNEST HOPE IT MAY BE OF SERVICE TO THEM,

AND WITH THE BEST WISHES OF

THE AUTHOR.

47789

PREFACE TO THE THIRD EDITION.

In preparing the third edition of this work, some portions have been entirely rewritten, and throughout such alterations and additions have been made as were considered requisite to keep it fully abreast with recent advances in Obstetric Science. A number of new illustrations have been added, selected chiefly from the works of Barnes, Lusk, Leishman, and Playfair, to whom I beg to acknowledge my indebtedness. In its newly revised shape, the Author trusts that it will more than ever fulfil the conditions that have earned for the previous editions the approbation of both students and practitioners of medicine.

A. F. A. K.

726 Thirteenth St., Washington, D. C.
September, 1886.

PREFACE TO THE FIRST EDITION.

THE chief purpose of this book is to present, in an easily intelligible form, such an outline of the rudiments and essentials of Obstetric Science as may constitute a good groundwork for the student at the beginning of his obstetric studies; and one by which it is hoped he will be the better prepared to understand and assimilate the extensive knowledge and classical descriptions contained in larger and more elaborate text-books. Confessedly, in great part, a compilation from these, it is upon the more recent treatises of Leishman, Playfair, and Lusk that I have most largely depended, as authorities, in dealing with matters that are still unsettled, and it is with pleasure I acknowledge my indebtedness to these authors.

Whatever value the work may possess as a book of reference for the practitioner, I cannot but hope it may prove of service to those whose onerous duties allow but little leisure for consulting larger works, and who simply desire to refresh their minds upon the more essential points of obstetric practice.

It will be observed I have ventured to anglicize the terms "*ante-partum*" and "*post-partum*" into, respectively, *ante-partal*" and "*post-partal.*" If this be considered an error, or an unwarrantable assumption, I can only plead guilty, and await sentence from my *confrères.*

For many of the illustrations—the plates of which were placed at my disposal by the publishers—I am indebted to the works of Meigs, Leishman, and Playfair; for others, which will be found only in this work, my grateful acknowledgments are cordially extended to my friend and former pupil, Dr. William Nicholson, of this city.

A. F. A. K.

726 Thirteenth St., Washington, D. C.
May, 1882.

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OBSTETRICS.

CHAPTER I.

INTRODUCTION.—THE PELVIS.

Obstetrics is the science and art of midwifery. Its object is "the management of woman and her offspring during pregnancy, labor, and the puerperal state." In its wider scope it embraces a knowledge of the structure and functions of the reproductive organs and of their relations to the general system.

The Pelvis.—The word "pelvis" means basin. It is a strong framework of bones, in which the reproductive organs are contained, and to which they are attached, and its cavity contributes to form a canal through which the child must pass during parturition.

It is composed of the right and left innominate bones, sacrum, and coccyx.

The Sacrum and Coccyx.—The following anatomical features of the sacrum are of obstetrical importance:

First, its *promontory*—the central, projecting, anterior border of the superior surface (or base) of the bone. From this promontory the antero-posterior diameter of the *brim* of the pelvic *basin* is measured, and a material reduction in its distance from the symphysis pubis, directly opposite, constitutes the *most common* variety of pelvic deformity. The *smooth convexity* of the promontoric border is important, for it causes the globular head of the child to glide off, during labor, to one or other side of the median line, where there is more room for it to pass, as will be explained hereafter.

Second. The *anterior concave surface* or "*hollow*" of the sacrum. It contributes to give amplitude and curvature to the pelvic canal. It is in conformity with the supra-infral curvature of the sacrum that the long obstetrical forceps is made with what is called its "sacral curve." Material increase or decrease in the degree of sacral curvature constitutes deformity, and may render labor mechanically difficult or impossible. Rarely, bony tumors (exostoses) spring from the anterior surface of the sacrum and obstruct delivery. This surface of the bone is pierced by the anterior sacral foramina, which give exit to the anterior sacral nerves. Pressure of the child's head upon these nerves may produce severe cramp in the lower limbs during delivery.

Third. Each *lateral surface* of the sacrum presents a rough, ear-shaped area—the *auricular, articular surface,*—covered with cartilage, which joins a similar shaped surface on the iliac bone, constituting the *sacro-iliac synchondrosis.* The posterior ends of the *oblique diameters* of the pelvic brim terminate at the sacro-iliac synchondroses.

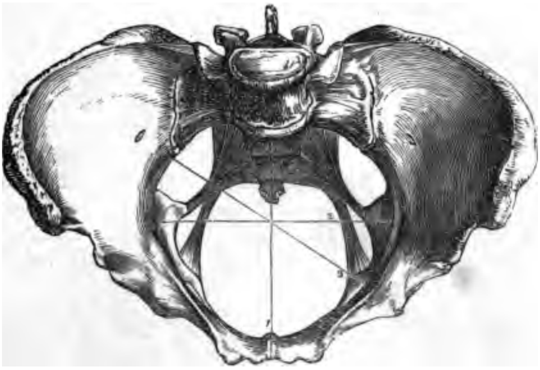
Fourth. The apex, or inferior extremity of the sacrum presents a transversely oval facet, covered with cartilage, for articulation with a corresponding oval surface upon the coccyx. The sacro-coccygeal articulation is an amphiarthrosis or mixed joint, furnished with a synovial membrane, and is movable; that is, the child's head during its passage out of the pelvis forces the coccyx backward, so as to leave more room between its tip and the symphysis pubis. In women past the prime of life this joint becomes ankylosed, the coccyx refuses to yield before the advancing head, and hence difficult labor.

Fifth. It is of the utmost importance to remember that the vertical measurement of the sacrum and coccyx, in the median line—*i. e.,* from the centre of the sacral promontory above, to the tip of the coccyx below—the line of measurement being a chord of the sacro-coccygeal curve—is four inches and a half in length (4½); exactly *three times as long as the vertical depth of the symphysis pubis,* which is one inch and a half (1½).

THE COCCYX.—The coccyx is triangular in shape. It is composed of four rudimentary (caudal) vertebræ, which diminish in size from above downward. Its base is attached to the lower extremity of the sacrum, as already explained.

THE INNOMINATE BONE.—The internal aspect of the bone only requires study. There we find a prominent line or ridge beginning at the sacro-iliac synchondrosis, a little below the level of the sacral promontory, and extending obliquely forward, slightly downward, and at the same time describing a somewhat semicircular curve inward toward the median line, where it eventually joins its fellow of the opposite side at the symphysis pubis; this line is the *linea-ilio-pectinea* of anatomists. It forms, with the sacral promontory, and two short ridges crossing the wings of the sacrum between the promontory and sacro-iliac synchondroses, a sort of cordiform outline, which is, in fact, the brim of the pelvic basin, or, technically, the *superior strait of the pelvis.* To recapitulate: the entire contour of the superior strait may be thus described: beginning in the median line at the centre of the sacral promontory, it passes outward across one lateral half of the promontory until reaching the wing of the sacrum, then across the wing outward, forward, and slightly downward, until reaching the sacro-iliac synchondrosis, then it traverses the ilium and pubis, as just described, along the linea-ilio-pectinea, until arriving at the spine of the pubis, and from thence to the symphysis pubis, and so on back, over the opposite side, until again reaching the centre of the sacral promontory from whence it started. (See Fig. 1.)

FIG. 1.



1. Antero-posterior (conjugate). 2. Bis-iliac (transverse). 3. Oblique.

The "false" pelvis, so called, is all that portion of the pelvis situated *above* the superior strait, and is made up chiefly by the wings, crests, and spinous processes of the iliac bones. Its bony wall is deficient in front; hence it is, of course, an imperfect or "false" basin.

The "true" pelvis is all that portion of the basin situated *below* the brim. Its cavity is a little wider in every direction than the brim itself, while the false pelvis is a great deal wider; the brim is, therefore, a somewhat narrowed bony ring or aperture between these two; hence the term "strait" is given it.

In the cavity of the pelvis we find, on each side, the prominent *spine* (spinous process) *of the ischium* and the *inclined planes* of the ischium. The ischial spinous process projects from the posterior border of the body of the bone, about midway down between the highest border of the great sciatic notch above and the lowest margin of the tuberosity of the ischium below. Its tip points at once downward, backward, and inward toward the median line, and extending from it forward and upward toward the upper margin of the acetabulum, is an indistinct ridge of bone. Now the smooth, slanting internal surface of the ischium in front of and below this indistinct ridge is called the anterior *inclined plane of the ischium*, or the anterior inclined plane *of the pelvis*—no matter which. Note, however, its direction: it slants downward, *forward*, and inward toward the median line; so that a rounded body like the fœtal head, coming down from above and impinging upon it, would glide at once *lower down*, *move forward*, and also *inward toward* the pubic symphysis. Hence it is instrumental in producing what is called "*anterior rotation*" of the occiput in the mechanism of labor.

Of course, there is an "inclined plane" of this sort on both sides of the pelvis, called respectively the *right* and *left* anterior inclined planes.

The posterior inclined planes of the pelvis are rather difficult to define, but we may map them out as follows: Draw a line on the inner surface of the pelvic cavity from the *spinous process* of the ischium to the *ilio-pectineal eminence* (in most pelves an indistinct ridge may be observed along this line). This line divides the anterior from the posterior inclined plane. But as there is only a small remaining surface of the ischium *behind* the dividing line to form the *posterior* plane, it is evident that, in the living woman, this plane is completed by the sacro-sciatic ligaments and the muscular structures, etc., that fill up and cover the sacro-sciatic foramina. In a dried pelvis, therefore, especially when divested of its sacro-sciatic ligaments, it is possible to see only a very small part of the posterior inclined plane, viz., that part where it begins on the back of the dividing line just mentioned. Its continuance or extension downward and backward to the median line of the hollow of the sacrum can only be seen when the muscles and ligaments are intact; and of which, in fact, the larger portion of the posterior inclined plane is made up.

The posterior inclined plane causes the presenting part of the child impinging upon it to rotate downward, *backward*, and inward toward the median line of the sacrum. Of course, there is a posterior inclined plane on each side—right and left.

Complete ossification of the pelvic bones does not take place till about twenty years of age, which affords a probable explanation why labor is generally more easy during the early part of adult life than later. The bones yield a little, and, after labor is over, the pelvis probably retains to some extent the size and shape acquired by the first early delivery, so as to render subsequent labors more easy.

After *thirty* years of age the *sacro-coccygeal joint* may become firmly ankylosed and ossified so as to prevent yielding of the coccyx before the pressure of the child's head, thus adding another obstacle to delivery.

THE SACRO-SCIATIC LIGAMENTS.—The greater sacro-sciatic ligament (sometimes called the "posterior" one) arises from the posterior inferior spinous process of the ilium, the lower part of the lateral margin of the sacrum, and from the coccyx: it is inserted into the *tuberosity* of the ischium. The *lesser* (or "anterior") sacro-sciatic ligament arises from the lateral margin of the sacrum and coccyx, and is inserted into the *spinous process* of the ischium.

These ligaments convert the great sciatic notch into the great sciatic foramen, and the lesser sciatic notch into the lesser sciatic foramen.

THE GREAT SACRO-SCIATIC FORAMEN transmits the pyriformis muscle, the gluteal vessels and nerve, the ischiatic vessels and nerves, the internal pudic vessels and nerve, and the nerve to the obturator internus muscle.

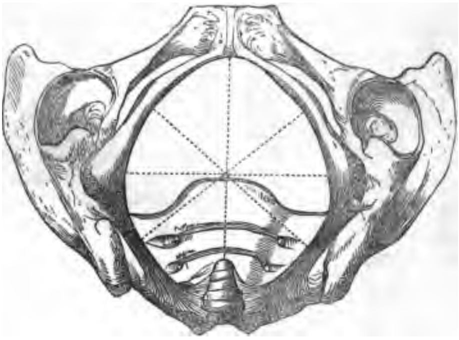
The Lesser Sacro-sciatic Foramen transmits the tendon of the obturator internus muscle, its nerve, and the internal pudic vessels and nerve.

The Obturator or Thyroid Foramen is situated in the antero-lateral part of the pelvic wall, between the pubis and ischium. Sometimes called the "foramen ovale." It is bridged over by a strong membranous web of ligamentous tissue, called the *obturator membrane*, from the inner and outer surfaces of which arise, respectively, the internal and external obturator muscles. The obturator vessels and nerve pass through an aperture in the upper margin of the obturator membrane.

The Pubic Arch is formed by the two descending rami of the pubes, and (in the female) its inner smooth surface, lined at its central upper part by the subpubic ligament, is of such shape and dimension as to be absolutely in unison with, and adapted to admit the passage of, the sides and base of the occipital pole of the fœtal head, as we shall see in describing the mechanism of labor in vertex presentations.

The Inferior Strait or "Outlet" of the Pelvis.—The dried bony pelvis, divested of its muscular appendages, is a basin without a bottom. The opening where the bottom ought to be is the inferior strait or outlet. Its contour may be described, in particular, as follows: beginning at the sum-

Fig. 2.



mit of the pubic arch, in the median line of the body, it passes downward and backward along the inner margin of the descending ramus of the pubes and the ramus of the ischium until reaching the tuberosity of the ischium, then along the great sacro-sciatic ligament to the side of the sacrum and coccyx, and tip of the latter bone; then back along the opposite side of the pelvis to the point of starting at the pubic arch. (See Fig. 2, page 30.)

ARTICULATIONS OF THE PELVIS:

First. The hinge-joint of the base of the coccyx with the apex of the sacrum (the *sacro-coccygeal articulation*).

Second. The junction of the auricular-shaped articular surface on the side of the sacrum, with a similar shaped surface upon the adjacent ilium, the articular surface on both bones covered by a plate of cartilage. This is the *sacro-iliac synchondrosis.*

Third. The *symphysis pubis,* formed by the apposition of the two bodies of the pubic bones in the median line. The articular surfaces are roughened by a series of nipple-shaped projections which dip into the layers of cartilage that cover them.

Fourth. The *lumbo-sacral articulation,* where the inferior aspect of the body of the last lumbar vertebra (covered with cartilage) rests upon the superior surface of the base of the sacrum, which is also covered by a cartilaginous plate. These two layers of intervertebral cartilage are much thicker in front than behind, which, of course, tilts the sacrum backward, and contributes to form the promontory.

Fifth. The *hip-joint,* but with regard to this we need only remember the *position* of the acetabulum in relation to the pelvic brim; it is situated near the antero-lateral part of the brim's circumference—in fact, nearly obliquely opposite the sacro-iliac synchondrosis of the other side, which is, of course, placed in the *postero-lateral* part of the pelvic circumference.

PLANES OF THE PELVIS. — The *inclined* planes of the ischium, sometimes called *inclined* planes of the *pelvis,* already studied, have nothing whatever to do with the planes of the brim, outlet, and pelvic cavity, now to be considered. Let it be distinctly understood that the "planes" and "*inclined*" planes are different things.

If we fill an ordinary basin with water, and float upon the surface a disk of paper whose circumference shall accurately fit the rim of the basin, the surface of the paper disk would represent the *plane of the brim* of that particular basin; in like manner, a disk of paper placed in the superior strait of the pelvis so that its circumference accurately fits the contour of the pelvic brim, would represent on its surface the "*plane of the superior strait*," or brim, of the pelvic basin. A disk of paper, similarly placed, in the outlet or inferior strait, would represent on its surface the "*plane of the inferior strait*," or outlet, of the pelvis. The surfaces of other disks placed at intermediate depths between the superior and inferior straits (such as might be imitated in the earthen basin by its different degrees of fulness) would constitute *planes of the pelvic cavity*, which latter might, of course, be multiplied in number indefinitely.

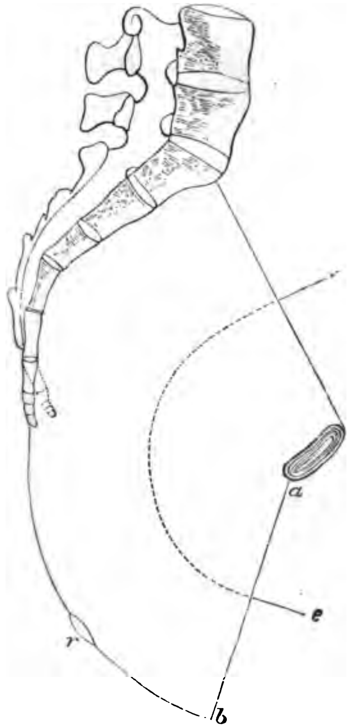
The *axis* of the plane of the superior strait is an imaginary line passing *through* the *centre* of the plane, at *right angles to its surface*, just as an axle-tree passes at right angles through the centre of a cart-wheel.

Owing to the anterior inclination of the pelvis when the woman stands erect, the brim is, as it were, tilted up behind, so that the plane rests at an angle of about 60° with the horizon. Hence, therefore, its axis, instead of being vertical, is so disposed as nearly to agree with a line drawn from the umbilicus to the coccyx.

The plane of the outlet is more nearly horizontal than that of the superior strait, but it is still elevated posteriorly, so that a line drawn from the tip of the coccyx to the highest point of the pubic arch will meet the horizon at an angle of about 11°, which, however, is subject to variation, inasmuch as the pressing *back* of the coccyx during labor also presses its tip *downward* to some extent, which, of course, renders the angle more acute. The *axis* of the plane of the inferior strait nearly agrees with a line drawn from the sacral promontory to the anterior verge of the anus.

The axes of the planes of the pelvic cavity are lines drawn through the centres of the planes at right angles to their surface. The axes of a great number of such planes, placed end to end, would form an imperfectly circular curve, or at least a polyhedral arc of a curve, which would represent the real *axis of the pelvic canal*. Such a curve was described by Carus, and known as Carus's curve, by placing one leg of a pair of compasses on the middle of the posterior edge of the symphysis pubis (in a bisected pelvis), the other leg of the compass having its point placed midway between the pubis and sacrum, and being moved so as to describe a curve from the superior to the inferior strait. But the true axis of the pelvic canal is not so geometrically perfect an arc of a circle as to admit of being drawn in this manner; it is more nearly the curve of an irregular parabola. (See Fig. 3.)

FIG. 3.



The pelvic canal in the living female does not really terminate at the inferior strait. In so far as its osseous walls are concerned it does, but the muscles and soft parts below form a continuation of the canal, and when these are stretched during parturition, the posterior wall of the lower, muscular part of the canal, viz., from the coccyx to the mouth of the vagina, measures quite as much as does the upper bony part, viz., from the coccyx to the sacral promontory. The *anterior* wall of the muscular part of the passage, corresponding with the pubis of the bony part, is of course deficient, and necessarily so, or the child could never be extruded in delivery. (See Fig. 3, page 33.)

The female pelvis differs from that of the male exactly in those particulars which render it better adapted to facilitate parturition, notably (first) in being altogether *wider* in every direction, which gives *more room* for the child to pass; and (second) in being altogether *shallower*, which *lessens the distance* through which the child has to be propelled; and (third) the bones are thinner and smoother.

In the female pelvis the pubic arch is broader and rounder, the hollow of the sacrum is less curved (especially as regards its three upper segments, which are almost straight), the obturator foramen is more triangular in shape, the sacral promontory, ischial spinous processes, and tip of the coccyx are less prominent (so that they encroach to a less degree upon the cavity of the pelvic canal), and the sacro-sciatic notches are more spacious than in the male.

CHANGES TAKING PLACE IN THE FEMALE PELVIS TOWARD THE END OF PREGNANCY.—The inter-articular cartilages become *thicker*; the ligaments *softer and somewhat relaxed*; synovial fluid is formed more plentifully in the articulations; and the joints become, *to an exceedingly limited extent, movable*, so as to be capable of yielding a very little, if necessary, to permit the passage of the child.

PROOF THAT THE JOINTS ACTUALLY YIELD DURING LABOR is inferred not only from the fact of its occurrence in the lower animals (in the guinea-pig the symphysis pubis separates an inch, so that the sacro-iliac synchondrosis plays the part of a hinge-joint; and in the cow the sacrum sinks down between the innominate bones, so as to push them wider apart), but also from the circumstances that in women dying during labor separation of the bones has been found on dissection; and in certain cases where the physiological loosening of the articulations has been pathologically exaggerated, locomotion has been interfered with, and the pubic symphysis found separated an inch or more.

MEASUREMENTS OF THE PELVIS.—The object of measuring the pelvis is to compare the length of its diameters with the diameters of the child that passes through it; without this it would be impossible to understand the mechanism of labor, or to render suitable assistance in cases of difficult delivery.

The size of the pelvis is not the same in all women. It differs in different races of mankind, and in different individuals of the same race. There is no reason why the pelves of any two women should be more exactly alike than the length of their feet or the features of their faces.

There are no means by which we can measure with precision (say within one-fifth or even one-fourth of an inch) the diameters of the pelvis in a living female; our measurements under such circumstances can only *approximate* the truth. Neither are there any means by which we can measure any more accurately the diameter of a child's head before it is born; we can scarcely do better than guess even its *approximate* measurements.

Hence there is no practical use in trying to define and teach the measurements of the average female pelvis with that extreme precision (down to the smaller fractions of an inch) attempted in many obstetric text-books. It complicates the matter without any special advantage; an approximate precision is all that is requisite—all that is possible.

DIAMETERS OF THE SUPERIOR STRAIT (see Fig. 1, page 27):

First. The *antero-posterior* (sacro-pubic, "conjugate"), extending from the middle of the sacral promontory to the *top* of the symphysis pubis.

Second. The *transverse* (bis-iliac), extending across the widest part of the strait, from the centre of one lateral margin of the brim to the other.

Third. The *right oblique*, extending from the right sacro-iliac synchondrosis[1] to the left acetabulum (or left ilio-pectineal eminence, which is nearly the same thing).

Fourth. The *left oblique*, extending from the left sacro-iliac synchondrosis to the right acetabulum.

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[1] The oblique are sometimes called right and left, according to the *acetabulum* they touch, instead of from the *sacro-iliac synchondrosis*, as in the text.

DIAMETERS OF THE INFERIOR STRAIT (Fig. 2, page 30):

First. The *antero-posterior* (coccy-pubic, called also "conjugate"), extending from the tip of the coccyx to the lower end of the symphysis pubis.

Second. The *transverse* (bis-ischiatic), extending across the outlet from one tuberosity of the ischium to the other.

Third. The *oblique* (of which, of course, there are two; right and left, as at the brim), extending from about the middle of the lower border of the great sacro-sciatic ligament of one side to the thickened portion of bone where the descending ramus of the pubis joins the ascending ramus of the ischium, or thereabouts, on the other.

DIAMETERS OF THE PELVIC CAVITY:

First. The *antero-posterior* (conjugate), extending from the centre of the symphysis pubis to the centre of the hollow of the sacrum.

Second. The *transverse*, extending across from a point nearly opposite the lower edge of the acetabulum on one side to a corresponding point upon the other.

Third. The *oblique* (of which there are two, right and left), extending from the centre of the great sacro-sciatic foramen on one side to the obturator foramen on the other.

(The diameters of the *cavity* are not so important as those of the brim and outlet.)

THE AVERAGE APPROXIMATE LENGTH of the diameters of the pelvic canal in the living woman are as follows:

Antero-posterior of the brim or superior strait . .	4 inches.
Transverse of the brim in the living female . . .	4½ inches.
(The transverse is 5 inches in the dried pelvis, owing to removal of the psoas magnus muscle, which takes ½ inch space on each side in the recent pelvis.)	
Obliques of the brim (right and left alike) .	4½ or 5 inches.
Antero-posterior of the outlet or inferior strait	4½ or 5 inches.
Transverse of the outlet	4 inches.
Obliques of the outlet (right and left alike).	4 inches.
Antero-posterior of the cavity	5 inches.
Transverse of the cavity	5 inches.
Obliques of the cavity (right and left alike)	5 inches.

The most important fact developed by these measurements is that the brim is longest in its oblique diameters, while the outlet is longest in its antero-posterior measurement, which explains the necessity of what is called "rotation" in the mechanism of labor.

In addition to these measurements of the pelvis, it is necessary to remember the depth of its walls; thus the depth of the *anterior wall—i. e.*, from the top to the bottom of the symphysis pubis is 1½ inches; while the depth of the *posterior wall*, from the sacral promontory to the tip of the coccyx (the line being a chord of the sacro-coccygeal curve), is just three times as long, viz., 4½ inches. The depth of the lateral wall is not of much importance: it is about 3½ inches.

In measuring the pelvis of the living female, externally, for the detection of deformity, it is necessary to remember the following:

1. Between the widest part of the iliac crests .	10½ inches.
2. Between the anterior superior spinous processes of the ilia	9½ inches.
3. Between the front of the symphysis pubis and the spinous process of the upper bone of the sacrum.	7½ inches.

In this last measurement a deduction of 3½ inches must be allowed for the soft parts, which would then leave 4 inches—the normal conjugate diameter of the brim, as we have already seen.

Muscular Structures of the Pelvis—*Above* the brim the muscles of the abdominal walls complete the wall of the "false" pelvis, where its bony wall is deficient in front, and they form the abdominal cavity, roofed above by the diaphragm, which agrees somewhat in shape with the full-term gravid uterus, so that by the contraction of the abdominal muscles and diaphragm during the pains of labor the womb is tightly embraced by them, and assisted in its expulsion of the child. *At* the brim we find the psoas magnus, which, arising from the side of the last dorsal and from the sides of all the lumbar vertebræ, passes down and crosses the brim, where it takes up half an inch of space at each end of the transverse diameter of the superior strait, to be inserted, with the conjoined tendon of the iliacus internus muscle, into the lesser trochanter of the femur. The action of these two muscles is to flex the thigh upon the pelvis and rotate the femur outward, and as this is the posture usually assumed by the parturient female, the muscles are prevented from being stretched taut, and thereby encroach less on the brim, and thus offer less obstruction to the passage of the child.

STRUCTURES FORMING THE FLOOR OF THE PELVIS AND MAKING A BOTTOM TO THE BASIN.—The pelvic floor ("pelvic diaphragm") is composed, chiefly, of fasciæ, muscles, and connective tissue. Its superior surface is lined by peritoneum. Next below, and in close contact with the peritoneum, comes the tough, elastic, "internal pelvic fascia," which is attached to the pelvic brim. Here it meets from above the fascia transversalis of the abdominal wall and the fascia lining the iliac fossæ. Below the brim it is firmly attached to the periosteum, and forms a tendinous arch (*arcus tendineus*) reaching from the inner border of the pubes to the spine of the ischium; from this arch it extends to the median line of the body. Immediately below the internal pelvic fascia are two thin muscles, viz.: 1st. The *levator ani*, each half of which arises from the body and horizontal ramus of the pubes and from the arcus tendineus, and passes downward and inward to meet its fellow of the opposite side in the median line, where it is inserted into a tendinous raphé extending from the coccyx to the rectum, while some fibres pass between and to the sides of the bladder and rectum, and to the vaginal and rectal sphincters. 2d. The *ischio-coccygeus* (called also simply "coccygeus"), which is a narrow, triangular slip, situated parallel with and posterior to the levator ani, closing in a little space which the latter muscle, as it were, failed to cover. It arises by its apex from the ischial spinous process, and is inserted into the side of the coccyx. Below these muscles, the pelvic floor is further strengthened by another layer of fascia—the *perineal fascia*. Its posterior portion—consisting of a single layer—is attached to the sides of the pelvis and arcus tendineus, from whence it is reflected over the inferior surface of the levator ani muscle, while its anterior part is divisible into a *deep* layer (covering the lower surface of the levator ani), a *median* and a *superficial* layer. Within these latter layers are lodged the pudic vessels and nerves, and the superficial muscles of the perineum. These muscles are (1) the *constrictor vaginæ*, each lateral half of which arises, posteriorly, from the perineal fascia midway between the anus and ischium (a small slip only passing to join the sphincter ani muscle), and passes forward to unite, by aponeurosis, with its fellow of the opposite site, near the clitoris; (2) the *sphincter ani*, which arises from the tip of the coccyx and is inserted into the tendinous centre of the perineum; (3) the *transversus perinei*, a narrow transverse slip arising from the ascending ramus of the ischium, and inserted into the sides of the vagina and rectum.

To the several structures of the pelvic floor above given, must now be added the integument and the very numerous interstitial layers of elastic connective tissue, which latter weld the parts together, and add strength and elasticity to the whole fabric.

Besides their motor function, the muscles covering the inner surface of the pelvis (including the pyriformis—not yet mentioned—which arises chiefly from and covers the hollow of the sacrum) provide a sort of muscular upholstery to the interior of the pelvis, by which its bony lines and prominences are cushioned over, so as to prevent injury to the soft parts during the passage of the child, while the infant itself receives the same protection.

CHAPTER II.

THE FŒTAL HEAD.

THE head of the fœtus requires special study, because, from its size and incompressibility, it is the most difficult part of the child to deliver; when the head is born, the rest of the labor is usually completed in a few minutes. The child's head, however, is not absolutely incompressible. Its bony wall is elastic to a certain extent in all parts except the base. By this arrangement, yielding of the bones permits pressure only upon the *upper part* of the fœtal brain, where, when moderate in degree, it is harmless; the same pressure upon the *base of the brain and medulla* would be fatal. While it is not true that the short transverse diameter of the child's head, viz., from one parietal protuberance to the other, is less than the transverse diameter of the trunk, viz., from one acromion process of the scapula to the other, still the bones and muscles of the arms, shoulders, and trunk are so mobile and flexible that, when they are jammed into the pelvis, the said bisacromial diameter is capable of being easily reduced to a less width than the transverse diameter of the skull; hence the head, though apparently *not*, practically *is* wider than across the shoulders.

SHAPE OF THE FŒTAL HEAD.—This does not correspond perfectly to any geometrical figure, but it will best suit our purpose to consider it ovoid or egg-shaped—the chin corresponding to the small end of the egg, the occiput to the large end, and the widest transverse circumference passing over the parietal protuberances. One aspect of the ovoid, viz., its base, is considerably flattened, and so are the sides of the head, but to a less extent.

The fœtal cranial bones are imperfectly ossified (and are therefore elastic); their sutural borders are surmounted by a rim of cartilage and are not united, and the several bones (except those of the base), being only held in apposition by the dura mater, pericranium, and skin, can be pressed closer together, or even made to overlap each other, during parturition. The posterior borders of the parietal bones especially, nearly always overlap the anterior borders of the occiput. The union of the upper, squamous part of the occipital bone with its basilar portion being only fibro-cartilaginous in character, this junction is somewhat movable, like a joint, hence pressure upon the prominence of the occiput easily depresses its anterior borders beneath the posterior borders of the parietal bones. The distance between the two malar bones can be reduced, by compression, only in a very slight degree.

SUTURES OF THE CRANIUM.—They are:

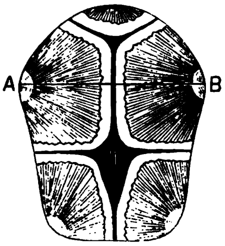
First. The *coronal* suture (or *fronto-parietal*), passing between the posterior border of the frontal bone and the anterior borders of the two parietals. It goes over the arch of the cranium from one temporal bone to the other.

Second. The *sagittal suture* (or *biparietal*), running along and between the superior borders of the two parietal bones and extending from the superior point of the occiput to the os frontis. It must be noted, however, that, in the fœtus, the two halves of the frontal bone have not yet united; they are divided by what is called the *frontal* suture almost to the root of the nose, and by some writers this frontal suture is regarded as a continuation of the sagittal

Third. The *lambdoidal* suture (or *occipito-parietal*), running between the superior, or rather antero-lateral, borders of the occiput and the posterior borders of the parietals, and extending from near the mastoid process of one temporal bone to that of the other.

FONTANELLES.—The *fontanelles* are spaces left in the skull at points where the angles of two or more bones finally meet. They are due to deficient ossification, and are explained by the general principle that ossification, beginning near the centre of a bone and extending toward its circumference, reaches the angles last because they are generally furthest from the centre. There are six fontanelles, but only *two* of them are of obstetric importance. These are the *anterior* (or fronto-parietal) fontanelle and the *posterior* (or occipito-parietal) one.

FIG. 4.



Showing shape of fontanelles, the long acute angle of the anterior one pointing toward the nose. A B. Biparietal diameter.

The shape of the *anterior* one may be approximately described by drawing lines between the four points of a crucifix; it is a four-sided figure, two of whose sides are equal—lozenge-shaped—the long acute angle being formed by deficient ossification in the posterior superior angles of the two halves of the frontal bone, and the short obtuse angle by deficient ossification in the anterior superior angles of the parietal bones. Its situation is where the coronal suture crosses the sagittal. In size it is a considerable membranous space, easily recognized by the finger, and often by the eye, and through it the motion of pulsation in the cerebral arteries may be both seen and felt. It is not completely closed till one or two years after birth. Remember particularly that the *long* angle of this fontanelle points toward the forehead and nose; the short one toward the occiput. (See Fig. 4.)

The *posterior* fontanelle is much smaller in size, being simply a triangular depression situated at the point where the sagittal suture meets the lambdoidal; radiating from it are *three* sutural arms, viz., the sagittal suture and the two arms of the lambdoidal. It closes a few months after birth.

The other four fontanelles, two on each side, are placed at the inferior angles of the parietal bones. They are unimportant.

REGIONS OF THE FŒTAL SKULL.—One of the most important is the vertex. Literally this means the highest part or "crown" of the head; but when in midwifery we speak of a "vertex presentation," we refer to a more posterior region of the skull, which I have already compared to the larger rounded extremity of an egg, and which has (I think very properly) been termed by some writers the "obstetrical vertex;" it may be defined as a circular space whose centre is the apex of the posterior fontanelle, and the circumference of which passes over the occipital protuberance.

Other regions of the fœtal head have been described, but they are not of great importance, viz., the "base" or flattened surface directed toward the neck, and the facial, frontal, and lateral regions, which explain themselves.

The space occupied by the anterior fontanelle is sometimes called *sinciput*, or *bregma*.

Diameters of the Child's Head, and their Approximate Average Length. (Fig. 5, page 43.)

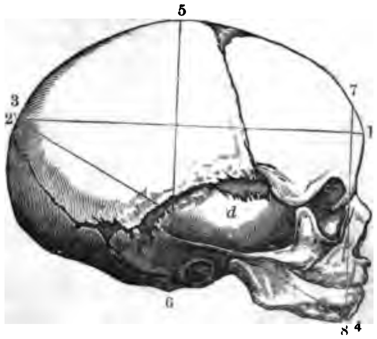
The *occipito-mental*, extending from the point of the chin to the superior angle of the occiput .	5½ inches.
The *occipito-frontal*, extending from the centre of the forehead to a point on the median line of the occiput a little above its protuberance . .	4½ inches.

The *biparietal*, passing transversely from one parietal protuberance to the other . . . . . . 3½ inches.

The *cervico-bregmatic* (called also "trachelo-bregmatic"), passing vertically from the posterior angle of the anterior fontanelle to the anterior margin of the foramen magnum . . . . . 3½ inches.

The fronto-mental, going from the top of the forehead to the end of the chin . . . . 3½ inches.

FIG. 5.



1–2. Occipito-frontal. 3–4. Occipito-mental. 5–6. Cervico-bregmatic (or vertical). 7–8. Fronto-mental.

Several other cranial diameters are given in some of the text-books, and the number might be indefinitely multiplied, but the above are all that require to be remembered.[1]

One other measurement (of great importance when considering the mechanism of face presentations) may be added, viz., the sterno-mental length of the child's *neck* when the chin is removed as far as possible from the sternum; it is 1½ inches—exactly the same as the depth of the symphysis pubis.

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[1] It should be noted that the head may be pressed out of its natural shape ("moulded") during delivery, and the direction of such distortion will vary with the kind of presentation, and consequently the cranial diameters will vary accordingly.

Again, let it be remembered that the object of measuring any particular diameter is to get the dimension of the head in that one direction, and, while authorities constantly differ as to the exact points on the skull at which the extremities of their diameters are to be placed, the practical principle in measuring crania may be illustrated thus: occipito-mental diameter *starts* at the point of the chin, and ends at some opposite point on the median line of the occiput *furthest removed from the point of starting*; the occipito-frontal *starts* at the most anteriorly projecting part of the median line of the forehead, and ends at a point on the median line of the occiput *furthest removed from the point of starting*; and so of the other diameters.

Articulation and Movements of the Head.—The motions of flexion and extension are provided for, in part, by the articulation of the occipital condyles with the atlas, and, in part, by the articulations of the cervical vertebræ. The motion of rotation (which cannot be forced beyond the fourth of a circle without danger) is provided for by the articulation of the atlas with the axis.

The articulation of the atlas with the cranium being nearer the occipital than the opposite pole of the head, is of importance in promoting "flexion" during labor, as will be explained further on. (See Chapter XIII.)

CHAPTER III.

EXTERNAL ORGANS OF GENERATION.

THE structures generally included in the external generative organs of the female are: the mons veneris, labia majora, labia minora (nymphæ), clitoris, vestibule, urethra and its meatus, the fossa navicularis, hymen, and carunculæ myrtiformes. The term "vulva" is generally used to express all of the genital structures just mentioned, except the mons veneris. The term "*pudenda*" has a similar meaning.

THE MONS VENERIS (*mont de Venus*) is a cushion of adipose, cellular, and fibrous tissue, situated upon the front of the symphysis and horizontal rami of the pubes. Its thickness varies with the obesity of the individual, and its prominence differs according to the degree of projection of the pubes. After puberty it is covered with hair, and is abundantly supplied with sweat and sebaceous glands. Its function is not positively known. It possibly serves the purpose of a brow, in preventing irritating secretions from the skin trickling into the vulvar fissure.

THE LABIA MAJORA, CALLED ALSO "LABIA EXTERNA" AND "LABIA PUDENDI," are the lips of the genital fissure, placed side by side in an antero-posterior direction. They begin at the lower part of the mons veneris (as if by a bifurcation of that structure), which is their thickest part, and pass at first downward, then horizontally backward, becoming thinner in their course, and join each other at a point about one inch in front of the anus. Their point of junction in front is called the *anterior commissure*, and their point of apposition[1] behind, the *posterior commissure*.

Like the lips of the mouth, they are covered internally with a layer of mucous membrane containing mucous follicles, and externally with integument which contains hair follicles and sebaceous glands. Between those layers the substance of the labia is composed of superficial fascia, connective, adipose, and elastic tissue, together with some smooth muscular fibres which are arranged in the form of a little sac (continuous above with the external inguinal ring) considered to be analogous with the dartos of the scrotum. The sac contains fat and cellular tissue, some terminal fibres from the round ligament of the uterus, and is occasionally the seat of hernia.

THE FOSSA NAVICULARIS.—Just before the labia come together posteriorly, they are united by a transverse fold of mucous membrane (which somewhat resembles the web of skin between the thumb and finger) called the *fourchette* (or frænulum pudendi), and the little depressed space between this and the posterior commissure is the *fossa navicularis*. It is generally obliterated after labor by rupture of the fourchette.

THE LABIA MINORA, OR NYMPHÆ, are thick double folds of mucous membrane, about one inch and a half long, which begin by gradually projecting from the inner surface of the labia majora, midway between the two commissures. They then pass forward until reaching the clitoris, when they split horizontally into two folds. The upper folds pass above the clitoris, and joining in the median line, contribute to form the *prepuce* of that organ, while the lower ones join underneath, forming its *frænum*. The nymphæ are covered with tessellated epithelium; they contain connective and muscular tissue, vascular papillæ, and sebaceous glands. They are very vascular, also erectile, and secrete an odorous sebaceous mucus which lubricates their surface and prevents adhesive union. Their function is not certainly known.

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[1] This is the description of the posterior commissure generally given, but Dr. Matthews Duncan has conclusively shown that the labia do not unite posteriorly *at an angle*, but running close to each other, the vulvar fissure terminates in a sort of horizontal "gutter" continuous with the perineum; hence I have applied the term "apposition" instead of "junction" to the posterior union.

THE CLITORIS is a small erectile body placed just inside the vulvar fissure, half an inch behind the anterior commissure. It is composed of two corpora cavernosa which are united in the median line, and end anteriorly in the glans clitoridis, but separate from each other posteriorly to form the two crura, which are attached to the rami of the pubes and ischia. It is considered to be the analogue of the penis, but differs from this organ in having no corpus spongiosum or urethral canal. The vascular bulbs of the vestibule and the intermediate plexus of veins uniting them on each side with the vessels of the clitoris, would, if united in the median line, represent the corpus spongiosum of the penis and bulb of the male urethra. The clitoris has two erector muscles; it is abundantly supplied with vessels and nerves, and constitutes the principal seat of sexual sensation. It is secured to the pubis by a suspensory ligament.

THE VESTIBULE is a triangular surface of mucous membrane, whose base is the anterior margin of the vaginal orifice; its apex terminates at the clitoris, and its two sides are bounded by the nymphæ. It is of little importance except as a guide for finding the *meatus urinarius,* placed near its lower margin.

On each side of the orifice of the vagina, enclosed in a thin layer of fibrous tissue, under the labia majora, is a spongy oblong mass of small convoluted veins, which, when distended during sexual excitement, assumes, in its entirety, the form of a filled leech, or of a diminutive banana. These are called the *bulbi vestibuli,* sometimes the *vaginal bulbs.* Their veins are continuous with those of the clitoris and vagina.

THE FEMALE URETHRA is one inch and a half in length; is larger than that of the male, and more easily dilatable; it begins at the meatus, which is situated immediately below the rim of the pubic arch, and passes backward, curving a little upward, to the neck of the bladder. It is composed of a mucous, muscular, and vascular coat. About one-eighth of an inch within the meatus are the openings of two tubular glands, just large enough to admit a No. 1 probe of the French scale. These glandular tubules run parallel with the long axis of the urethra, beneath the mucous membrane, in the muscular wall. They vary from three-eighths to three-fourths of an inch in length.

THE HYMEN is a crescentic-shaped fold of mucous membrane whose convex border is attached to, and continuous with, the posterior wall of the vaginal orifice, just inside the fourchette. Its sides then run upward to terminate in the horns of the crescent, which last are united by its anterior concave border. It varies in form in different women. Sometimes the horns of the crescent, instead of coming to a point, are continued as a narrow band to the anterior vaginal wall, where the ends join each other, leaving a circular or oval opening in the centre. Occasionally it covers the orifice of the vagina entirely ("*imperforate hymen*"), or it may present a number of very small openings ("*cribriform hymen*"). It also varies in thickness and strength, It is usually ruptured by the first act of *coitus*, though not always, and may be torn by other causes, so that it is by no means so sure a sign of "virginity" as was formerly supposed. Moreover, it is sometimes absent altogether.

THE MYRTIFORM CARUNCLES (CARUNCULÆ MYRTIFORMES).—Formerly these were said to be shrivelled projecting remains of the ruptured hymen; subsequently they were considered to be vascular membranous prominences placed immediately behind the hymen, and quite independent of it. More recently they have been ascribed to childbirth, pressure of the child's head during labor causing necrosis and sloughing of the previously torn hymen, of which, therefore, these so-called caruncles are the only visible remains. This last view is probably correct, and explains why the caruncles are often absent.

CHAPTER IV.

INTERNAL ORGANS OF GENERATION.

THE INTERNAL ORGANS OF GENERATION are the vagina, uterus, Fallopian tubes, and ovaries.

THE VAGINA is a membranous canal extending from the vulva to the uterus, hence sometimes called the "vulvo-uterine canal."

It is made up of a mucous membrane (covered with pavement epithelium), continuous with that of the vulva and uterus. Outside the mucous coat is a thin muscular layer, continuous with the uterine muscles, whose fibres run, some longitudinally, some in a circular direction, and others obliquely. The muscular coat becomes thicker during pregnancy. It is extremely vascular, its vessels being so disposed as to constitute an erectile tissue, especially toward the vulva. Cellular and fibrous tissues also enter into the composition of the vaginal wall.

Underneath the epithelium of the mucous membrane are a large number of vascular papillæ. Along the median line of the anterior and posterior vaginal walls there is a vertical ridge in the mucous membrane (the "anterior and posterior columns" of the vagina), and diverging from these, laterally, the mucous coat is thrown into transverse ridges which admit of dilatation of the canal during labor.

Its posterior wall is about three and a half inches long, its anterior wall about three inches. Its diameter is a little above an inch. At rest, the anterior and posterior walls are in contact with each other.

With regard to the exact situation and direction of the vagina, the descriptions and illustrative plates of anatomists differ widely. Roughly speaking, according to Leishman, "it lies in the axis of the pelvis, but its axis is placed anterior to the pelvic outlet, so that its lower portion is curved forward."

Its attachments to adjoining organs are as follows: the posterior wall is connected by its *middle three-fifths* with the rectum, the united walls constituting the recto-vaginal septum; its *lower fifth* is separated from the rectum, and is in contact with the perineal body; while its *upper fifth* is in contact with the fold of peritoneum which descends behind the womb to form Douglas's *cul-de-sac.* Its anterior wall is united by connective tissue with the posterior walls of the bladder and urethra, constituting, respectively, the vesico-vaginal and urethro-vaginal septa.

The upper extremity of the vaginal cylinder surrounds and is attached to the neck of the uterus: it is called the *fornix.*

On each side of the orifice of the vagina are the *bulbi vestibuli* already described. Immediately beneath and behind the posterior round extremity of this bulb of the vestibule is placed, on each side, the *vulvo-vaginal gland* (analogue of Cowper's gland in the male, and variously called the gland of Huguier and of Bartholini). It is a conglomerate gland, varying in size from a horse-bean to an almond, and secretes, during sexual excitement, an exceedingly viscid mucus, which is discharged from the orifice of the gland-duct into the fossa navicularis.

The vagina is abundantly supplied with nerves, especially toward its orifice, where it is endowed with a peculiar sensibility. Its arterial supply is derived from the uterine, hypogastric, vesical, and pudendal arteries; and its numerous venous plexuses, continuous with those of the vulva, clitoris, and uterus, terminate in the hypogastric veins. The vaginal veins have no valves.

THE UTERUS is a thick-walled hollow organ, in the form of a truncated cone, slightly flattened antero-posteriorly, situated in the middle of the pelvic cavity, its upper end being a little below the plane of the superior strait. The bladder is in front of it, the rectum behind, and the vagina below it. The small intestine rests upon it from above. It has *three coats:* (1) a serous coat (peritoneum) on the outside; (2) a muscular coat, which gives thickness and solidity to the uterine walls, and is composed of non-striated muscular fibres arranged in layers, having different directions, circularly, longitudinally, and spirally, which are closely adherent to and decussate with each other; (3) a mucous lining continuous with that of the vagina and Fallopian tubes, and covered with ciliated col-

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umnar epithelium. That portion of the neck of the uterus which projects into the top of the vagina is covered externally with pavement epithelium. This last joins the columnar epithelium of the interior of the uterus just within the external os uteri.

In length (counting the thickness of its upper wall) it is (roughly) about 3 inches; its width, transversely across its widest upper part is 1½ inches; and its greatest antero-posterior thickness 1 inch. At the end of pregnancy it attains the size of a foot or more in length, and 8 or 10 inches transversely.

It is divided by anatomists into fundus, body, and neck. The *fundus* is all that rounded portion placed above a horizontal line drawn through the angles where the Fallopian tubes open into the womb; the *body* is all that portion between the fundus and the neck; and the *neck* is all that part below a line drawn horizontally through the organ at the level of the internal os uteri.

Its cavity is divided into the cavity of the body and the cavity of the neck. That of the body is triangular and flattened antero-posteriorly; it has three openings, those of the two Fallopian tubes above, and that of the os internum below. The cavity of the neck is barrel-shaped or fusiform, and comparatively narrow; it is constricted above by the internal os that separates it from the cavity of the body, and grows narrow again at its termination in the external os uteri.

MICROSCOPIC STRUCTURE OF THE UTERINE MUCOUS MEMBRANE.—It is composed of mucous follicles ("utricular glands") placed perpendicularly to the internal surface of the womb. Their mouths open into the uterine cavity, and they terminate by rounded bulbous extremities (some of which are bifurcated) upon the muscular coat. The follicles are lined with columnar epithelium; and some idea may be formed of their size ($\frac{1}{30}$th of a *line* in diameter) by remembering that there are about ten thousand of them in the mucous membrane of the *cavity* of the *neck* alone.

BROAD LIGAMENTS OF THE UTERUS.—These are simply folds of peritoneum covering the external surface of the womb. Let us imagine a line drawn across the outside of the top of the fundus and prolonged transversely until it reaches the sides of the pelvis. Beginning at this imaginary line a broad layer of peritoneum passes down over the *anterior* wall of the womb to the level of a point midway between the internal and external os, when it turns up and is reflected over the posterior wall of the bladder: this is the *anterior* broad ligament. A similar fold passes down over the posterior wall of the womb, going low enough to cover the upper one-fifth of the posterior *vaginal* wall (as already explained), when it turns up and is reflected over the anterior wall of the rectum: this is the *posterior* broad ligament. Thus the uterus, with (and between) its two broad ligaments, forms a sort of transverse partition to the pelvic cavity; the bladder, urethra, etc., being in the front compartment, and the rectum in the back one. The lateral borders of this double ligamentous curtain are attached to the sides of the pelvis, and hence these ligaments are sometimes called "right" and "left," instead of "anterior" and "posterior," as above.

OTHER LIGAMENTS OF THE UTERUS:

First. The *round ligaments*, which are fibro-*muscular* cords, 4½ inches long. They begin near the superior angles of the womb, and pass between the two folds of the broad ligaments, successively outward, forward, and then inward, to the internal inguinal ring, and through the inguinal canal, their terminal fibres being lost in the *mons veneris* and *labia majora.*

Second. The *vesico-uterine* ligaments: semilunar-shaped folds of peritoneum passing from the lower part of the body of the uterus to the fundus of the bladder.

Third. The *utero-sacral* ligaments: crescentic-shaped folds of peritoneum passing from the lower part of the body of the uterus to be inserted into the third and fourth sacral vertebræ.

Fourth. There is still another short cord, containing many smooth muscular fibres, extending from near the upper angle of the uterus to the inner extremity of the ovary. It is about one inch in length, and is called the *utero-ovarian* ligament—sometimes the "*ligament of the ovary.*" All the ligaments of the uterus contain some muscular tissue, which is increased during pregnancy.

ARTERIES OF THE WOMB.—The *uterine* artery (one on each side) is a branch of the hypogastric, hence called *arteria uterina hypogastrica.* It descends behind the peritoneum to the fornix vaginæ, where its pulsation may be felt with the finger during pregnancy, and then ascends between the anterior and posterior folds of the broad ligament, along the side of the cervix and corpus uteri (to both of which it gives off many deeply penetrating branches), and, finally, its main trunk becomes directly continuous with

The *ovarian* artery (one on each side, corresponding with the spermatic artery of the male), which is given off from the aorta 2½ inches above its bifurcation, hence called *arteria uterina aortica.* It descends into the pelvic cavity, and then ascends between the two folds of the broad ligament to the Fallopian tube, ovary, and fundus uteri, and terminates by anastomosis with the hypogastric uterine artery just described.

At the junction of the body and cervix uteri is a circumflex branch which unites the arteries of the two sides, and which, when cut during surgical operations, bleeds profusely. The arterial branches in the uterine walls are remarkable for their numerous anastomoses and spiral course, the latter quality providing—it is supposed—for their longitudinal extension during pregnancy, a supposition that is very materially weakened by the fact that the arteries are *more* tortuous during pregnancy than before. Moreover, the arteries of the ovary present the same spiral course.

VEINS OF THE UTERUS.—These begin by small branches continuous with the fine plexus of capillaries into which the uterine *arteries* divide in the internal lining of the organ, and, inosculating freely with each other, unite to form larger veins (always *without* valves) in the substance of the uterine wall, from whence they eventually pass out toward the folds of broad ligament, where, joining the ovarian and vaginal veins, a remarkable venous network is formed, known as the "*pampiniform plexus.*" On each side of the uterus, near its junction with the top of the vagina, the greater number of vessels in this plexus pour their blood into a trunk of considerable size —the internal spermatic vein—which empties on the right side into the vena cava, and on the left into the left renal vein.

NERVES.—The nervous supply of the uterus is received chiefly from the sympathetic system, viz., from the hypogastric, renal, spermatic, and aortic plexuses.

There is no longer any doubt that it also receives branches from the cerebro-spinal system, derived chiefly from the first, second, and third sacral nerves. During pregnancy the nerve fibres increase in size.

Lymphatics.—The womb is abundantly supplied with lymphatics, and its lymphatic vessels terminate in the pelvic and lumbar glands.

Functions of the Uterus.—It is the source of the memstrual discharge; it receives spermatic fluid from the male, and the germ-cell—whether impregnated or not—from the female; it provides a place for the fœtus during its development, and is the source of its nutritive supply; and it contracts at full term to expel the child.

During gestation *all* the tissues of the uterus undergo a decided physiological *hypertrophy*. After delivery they go through a sort of gradual physiological *atrophy*—back again to what they were before conception. The enlarged muscles especially undergo fatty degeneration and absorption—called "*involution*," in contradistinction to "*evolution*" or development. The process of involution requires a month or six weeks for its completion, sometimes longer.

Mobility of the Uterus.—The womb in its normal condition is not fixed or adherent to any part of the skeleton, but enjoys considerable mobility: it is simply suspended or hung in the pelvic cavity by the tent-like aprons of peritoneum and other ligaments attached to it, as well as by its nerves, bloodvessels, and vaginal attachments. A full bladder pushes it backward; a distended rectum, forward. It changes its position, by gravity, as the female changes her posture. Viewed through a speculum the vaginal part of its cervix may be seen to rise and fall with every motion of the diaphragm during respiration—an observation becoming still more apparent during the violent diaphragmatic motions that attend laughing. Forcible injection of the uterine arteries after death causes the uterus to rise in the pelvis and execute a movement resembling that performed by the penis during erection, and which leads to the supposition—difficult of proof—that this actually takes place during life under venereal excitement.

Fallopian Tubes.—Given off from the uterus, at each of its superior angles, is a tube whose canal is continuous with the uterine cavity. These are the Fallopian tubes (sometimes called "oviducts").

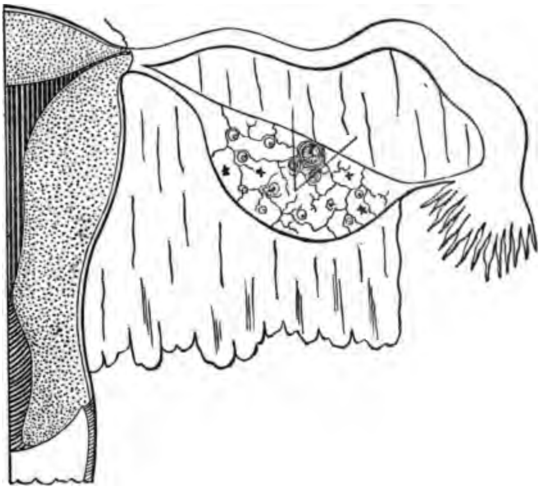
Each tube is about four inches long; near the uterus its diameter ($\frac{1}{25}$th of an inch) will just admit a bristle, but increases in size in its course from the womb toward the free distal end of the tube, where it is as large as a goose-quill. The tube passes from the uterus in a somewhat tortuous course, between the folds and along the upper margin of the broad ligament, toward the side of the pelvis, and terminates in a dilated, trumpet-shaped extremity, the free margin of which is, as it were, frayed out into a number of fringe-like processes called "fimbriæ;" one of these, longer than the rest, is attached to the outer extremity of the ovary. Some of the fringed processes are continued as thin, leaf-like, longitudinal folds of mucous membrane into the dilated end of the tube.

Like the uterus, the Fallopian tubes are composed of three coats: 1. A *serous* (peritoneal) coat on the outside; 2. A *muscular* coat composed of two layers, viz., circular fibres (internally) and longitudinal ones (externally); 3. A mucous coat continuous with that of the uterus, and lined with ciliated columnar epithelium. At the distal end of the tube the mucous coat is continuous with the peritoneum, and furnishes the only instance in the body where a serous and mucous membrane are thus joined.

Functions of the Fallopian Tube.—It conveys spermatic fluid from the uterus to the ovary, and conducts the germ-cell from the ovary to the uterus. When the ovule (germ-cell) is about to be discharged from the ovisac, the fimbriæ of the tube grasp the ovary, so as to promote the safe entrance of the diminutive germ-cell into the trumpet-shaped mouth of the tube, from whence it is conveyed, by peristaltic motion of the canal, into the uterus; this transmission of the germ is also assisted by the cilia of the epithelium which wave toward the womb.

The Ovaries.—They are two in number (rarely three), and are placed one on each side of the womb between the posterior and anterior layers of the broad ligament, behind and below the Fallopian tube. The folds of broad ligament form for the ovary a sort of mesentery, and between its two layers the vessels and nerves pass to the organ. The ovary is connected to the trumpet-shaped end of the Fallopian tube by a single fimbria, and to the uterus by the fibro-muscular "ligament of the ovary," already described. Its anterior margin is attached to the posterior surface of the anterior fold of the broad ligament, while the remainder of the surface, except at the hilum where the bloodvessels enter, is covered by the posterior layer of the same ligament. It is one inch and a half in length, three-quarters of an inch wide, and one-third of an inch thick. Weight, from one to two drachms. It is an elongated, oval-shaped body, flattened from above downward, and hence said to be "almond-shaped." Its *function* is ovulation, that is to say: the production, development, maturation, and discharge of ovules. Hence the ovaries are said to be the essential organs of generation in the female, as the testicles are in the male. (Fig. 6 shows relations of ovary with uterus and Fallopian tube. A triangular bit of ovarian stroma, showing ovum magnified, is seen in Fig. 7, page 56.)

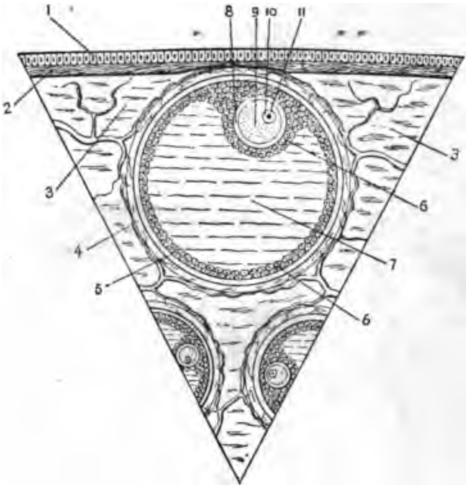
FIG. 6.



Relation of ovary with uterus and Fallopian tube.

✓STRUCTURE OF THE OVARY.—Anatomists generally describe it as being covered on the outside by a layer of peritoneum, but microscopists have lately informed us that this external covering is not true peritoneum, but a layer of columnar epithelium, probably continuous with that lining the Fallopian tubes, and therefore more nearly resembling a mucous than a serous tissue. Immediately underneath this layer is a thick coat of *white* fibrous tissue, the *tunica albuginea.* Inside this last we find the solid substance of the ovarian body (the kernel of the ovarian nut, so to speak) called "*stroma.*" It is composed, for the most part, of fibrous and muscular tissue, and is highly vascular. Dotted about in different parts of the stroma are little round cavities, called "Graafian *follicles.*" The wall of these globular follicular cavities is made up of the stroma substance itself, being in fact composed of a condensed layer

FIG. 7.



Triangular bit of ovarian stroma cut from ovary. Magnified to show Graafian follicle and ovule.—1. Epithelial covering of ovary. 2. Tunica albuginea (fibrous). 3, 3. Different parts of stroma. 4. Graafian follicle (tunica fibrosa). 5. Graafian vesicle or ovisac. 6, 6. Tunica granulosa. 7. Liquor folliculi. 8. Vitelline membrane or zona pellucida. 9. Granular vitellus or yolk. 10. Germinal vesicle. 11. Germinal spot.

of the stroma's connective or fibrous tissue, and is therefore sometimes called "*tunica fibrosa.*" It is immediately surrounded on all parts of its periphery with an elaborate network of capillary bloodvessels. Fitting close inside and completely filling the "Graafian follicle" is the "Graafian *vesicle*" or "*ovisac,*" sometimes termed, in contradistinction to the tunica fibrosa, the "*tunica propria.*" Loosely adherent to the inside of the ovisac all around is a granular layer of epithelial cells, the "*tunica granulosa.*" Inside this is the "*liquor folliculi*" (or fluid contents of the ovisac), in which floats the *human egg,* or *ovule.* It is only a yolk; there is no white to it, so that the next membrane we have to encounter is the yolk membrane, technically the *vitelline membrane,* or zona pellucida, containing the "*vitellus*" or yolk. Imbedded in the substance of the yolk is the "*germinal vesicle,*" and inside *that* the "*germinal spot.*" Besides the tunica granulosa covering the *inside* of the ovisac, a reflected layer of it is disposed all around the *outside* of the vitelline membrane. At birth it is said each human ovary really contains about 30,000 Graafian follicles, with their contents, but only the few that are approaching maturity are large enough to be seen with the naked eye. The way in which the ovule (egg, germ-cell, but not called ov*um* until impregnated) gets out of the ovary is as follows: as the Graafian follicle reaches maturity, it approaches the surface, and begins to cause a protuberance (like a little boil) upon the outside of the ovary. Eventually, the peritoneal (or epithelial) external coat, the tunica albuginea, the wall of the Graafian follicle (tunica fibrosa), and the wall of the Graafian vesicle (or ovisac), all burst at the same point, and out comes the vitelline membrane, safe and whole, with its contents, and clinging around it is a loose irregular mass of the "tunica granulosa," now to be called the "*proligerous disk.*"

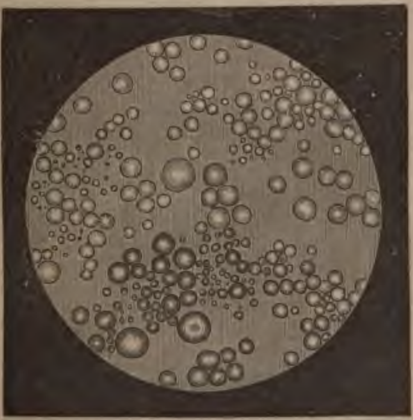
At the moment of rupture of the follicle, the ovule is received by the Fallopian tube and afterward conveyed to the uterus.

THE CORPUS LUTEUM.—After discharge of the ovule, together with the liquor folliculi, and that part of the tunica granulosa clinging to the ovule (called *then* the proligerous disk), the empty deserted ovisac fills up with a clot of blood, to which are subsequently added newly proliferated cells of the membrana granulosa; wandering white corpuscles from the blood; and a "vitellus-like substance" of a *yellow* color containing granules and globules resembling those of the vitellus. The white blood-corpuscles accumulating near the wall of the vesicle, press the remaining contents toward the centre of the cavity, while vascular papillæ project on all sides toward the centre. The larger vessels indenting the yellow mass, impart to its exterior a folded appearance formerly ascribed to convolutions in the wall of the ovisac. Eventually the contents of the sac are absorbed, and the follicle shrivels and contracts into an insignificant cicatrix or dimple. The yellow color of the contents of the ovisac has caused the site of the discharged ovule to be called "corpus luteum"—yellow body. Corpora lutea are of two kinds, "true" and "false." If the ovule be impregnated, a *true* corpus luteum is developed; if impregnation have not taken place, there results a *false* corpus luteum. The special (chief) differences between the two are as follows: 1st. The false corpus luteum increases in size for three weeks only, the true one continues to grow for about five months. 2d. After three weeks the false corpus luteum declines rapidly in size, and is reduced to a cicatricial dimple at the end of two months; while the true one, having grown so large as to occupy the greater part of the ovary by the fourth or fifth month, remains about of the same size during the fifth and sixth months, then gradually declines during the seventh, eighth, and ninth months, but it is not reduced to an insignificant cicatrix until one or two months after delivery. 3d. A true corpus luteum is single; a false one will be accompanied (either in the same or the opposite ovary) by the visibly evident remains of its predecessor. 4th. The cicatrix resulting from a true corpus luteum is more distinctly stellate than the cicatrix of a false one.

THE PAROVARIUM (sometimes called the "organ of Rosenmüller").—It is the remains of the *Wolffian body* of fœtal life, and corresponds to the epididymis of the male. Placed in the posterior fold of the broad ligament, where it may be seen by holding up the latter and looking through it by transmitted light, it consists of from ten to twenty tortuous tubes arranged in a pyramidal form (like the ribs of a fan), the base of the pyramid being toward the Fallopian tube, its apex lost on the surface of the ovary. No excretory duct; function unknown.

THE MAMMARY GLANDS, whose function it is to secrete milk for the sustenance of the child after birth, properly belong to the reproductive system. In shape, the gland is a flat, very flat, hemisphere, its base resting upon the pectoralis major muscle, between the third and sixth ribs. By cutting a large orange transversely through its equator, each half would give an approximate idea of the shape of the gland, and on the cut surface will be seen radiating trabeculæ, between which the pulp of the fruit is placed, that fairly resemble the radiating trabeculæ of fibrous tissue, fifteen or twenty in number, between which the so-called "lobes" of the secreting substance of the mammary gland are contained, and which are continuous with the circumferential fibrous capsule of the organ. The lobes are made up of lobules, and the lobules of terminal culs-de-sac (acini) lined with columnar epithelium. Each acinus empties its secretion (the milk being formed by desquamation, fatty degeneration, and rupture of the epithelial cells) through a little duct, which unites with others to form a larger duct for the lobule, and the lobular ducts unite to terminate in a still larger duct for each lobe, termed the *galactophorous duct*. The galactophorous

FIG. 8.



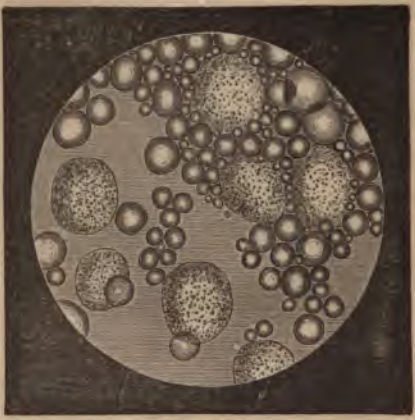
Globules of healthy milk; fourteen months' lactation.

ducts, fifteen or twenty in number, one for each lobe, converge toward the nipple, becoming widely dilated as they approach it, but narrowing again as they actually enter it.

Viewing the breast externally, we see the apex of the mammary projection surmounted by a pink disk of skin called the *areola*. From the centre of the areola projects the *nipple*, and beneath the disk is a circular band of muscular fibres, which, in contracting, assists the expulsion of milk.

As already stated, milk is formed by breaking down of the cell wall of the epithelium cells lining the acini of the mammary glands, and liberation of the cell contents, consisting of fatty granules and liquid protoplasm. The free fatty granules coalesce and aggregate together, and thus form larger masses called milk-globules, which are still so small as to be microscopic, and constitute a fatty emulsion with the more fluid portion of the milk in which they float. (See Fig. 8, page 59.)

FIG. 9.



Showing colostrum and ordinary milk globules, first day after labor; primipara, aged nineteen. (After Hassall.)

During the first day or two of lactation, however, the particles of fat are held together in masses of considerably larger size, having a granular appearance, and called "colostrum corpuscles," as seen in Fig. 9.

The mammary glands receive their blood supply from the internal mammary and intercostal arteries. Their nerves are derived from the intercostal and thoracic branches of the brachial plexus. They are also abundantly supplied with lymphatic vessels, which open into the axillary glands.

CHAPTER V.

MENSTRUATION AND OVULATION.

MENSTRUATION is a monthly hemorrhage from the uterine cavity.

It is called "*catamenial discharge*," "*menses*," and "*menstrual flow*," or in common *parlance* the "*monthly sickness*," the "*flowers*," the "*turns*," the "*courses*," the "*periods*;" or the woman is said to be "*unwell*."

We have already defined ovulation to be the development and maturation of ovules in, and their discharge from, the ovary. What relation has this process to menstruation?

About the time when an ovule is ripe and soon to be discharged, the reproductive organs, especially the ovaries and uterus, receive an extra amount of blood—they become physiologically congested in anticipation of impregnation taking place (for the menstrual period is really analogous with the period of "heat" or "rut" ("œstruation") in other animals); but in the absence of impregnation, the extra blood-supply, which was designed to prepare the organs for the reception and development of an *impregnated* germ, fails of its natural purpose, and is discharged in the form of menstruation. Menstruation is therefore dependent upon, and more or less coincident with, ovulation—this is the "*ovulatory theory*" of menstruation so called. Objections have been urged against this theory. *First.* It is said the menses have recurred after removal of both ovaries. (Answer. This is extremely exceptional; the removal may have been incomplete; there is sometimes a third ovary; the spayed women used as guards to the harems of Central Asia do not menstruate; finally the menstrual discharge having been continued for years, may persist from *habit*, even after the original cause, viz., ovulation, has ceased to recur.) *Second.* It is alleged that women do not allow coitus, and become impregnated *at* the menstrual periods, but always *between* the periods, from which it is inferred ovulation is *not* coincident with menstruation. (Answer. The human female, like other animals, is really more liable to impregnation when cohabiting near the menstrual period, and the same greater liability probably obtains *at* the period, did not the flow prevent cohabitation; moreover, the union of the germ-cell with the spermatic fluid of the male may take place *at* the ovulatory period from the survival of spermatozoa introduced by coitus a week or more before ovulation; the ovule also may remain after being discharged from the ovary, and be impregnated a week or more after menstruation.) *Third.* It is stated that ovules are discharged from the ovary without any accompanying menstrual flow. (Answer. This may be admitted and explained without fatally conflicting with the theory. It is, however, exceptional.) On the whole, the ovulatory theory of menstruation is the best yet propounded, and must be received, at least, for the present.

CHANGES IN THE UTERINE MUCOUS MEMBRANE AT THE MENSTRUAL EPOCHS.—Just before the flow the membrane becomes much thicker, congested, and thrown into shallow folds. Then it undergoes disintegration by fatty degeneration, and is thrown off with the blood that flows from the opened capillary bloodvessels. There exists some discrepancy of opinion as to *how much* of the mucous membrane is thrown off every month, but no doubt exists as to the fact of its becoming physiologically hypertrophied just before the menses, and of its undergoing a certain degree of fatty atrophy and degeneration during and immediately after the period. Shortly after menstruation, a new mucous membrane is already in course of preparation.

Some writers affirm that the ovule discharged at a given menstrual period does not really belong to that period, but to the next subsequent one, that is to say: the menstrual process (decidual degeneration) occurring, *ex. gr.*, at the middle of February, is the breaking up of the decidual membrane prepared for the ovule set free a month before, at the middle of January. This theory, though endorsed by high authority, has no indisputable facts to support it, and is, in my opinion, altogether untenable.

What becomes of the Ovule?—When not impregnated, it is lost and discharged with the menstrual flow; either before or after its disintegration. It is too small to be seen. The vitelline membrane is a mere cell, $\frac{1}{120}$th of an inch in diameter; and its contained germinal vesicle measures $\frac{1}{720}$th of an inch; the germinal spot about $\frac{1}{3000}$th. The "vesicle" is the nucleus of the cell; the "spot" its nucleolus; the entire egg simply a mass of protoplasm.

The First Menses and Puberty.—*Menstruation* begins at about fourteen or fifteen years of age—the "*age of puberty*" so called. This period is preceded and attended by what are called the *signs of puberty*. They consist in the development of womanly beauties, physiologically designed to attract the male; enlargement and growth of hair upon the mons veneris and labia majora, enlargement and increased rotundity of the hips and breasts; the vulva is drawn downward and backward, so that in the erect posture no part of it is visible anteriorly as it is in children; striking changes also occur in the inclinations and emotional susceptibilities of the female.

Circumstances modify the age at which the first menstruation takes place: thus, the menses appear earlier in *hot climates*, but the difference between the hottest and coldest climates is only about three years; the influence of *race*, which remains potent in spite of climatic changes; *occupation and mode of life:* luxury, stimulants, indolence, hot rooms, pruriency of thought, etc., render the woman precocious, while opposite conditions retard the menses; general robustness of constitution and vigorous health promote the development of menstruation, and it is delayed by feebleness and debility. On the other hand, a very tall woman with large bones and muscles will require more time to complete her growth, and hence the reproductive functions will be belated.

The very rare and unique cases, indisputably authenticated, in which children one or two years old have presented the external anatomical evidences of puberty, and have then menstruated with more or less regularity, and have even become mothers before they were ten years old, are mere medical curiosities—*lusus naturæ*—of but little import in discussing the physiology of this subject.

SYMPTOMS OF MENSTRUATION, not always present, are lassitude and depression of spirits, headache, backache, chilliness, weight in hypogastrium and perineum, nausea, neuralgia, hysteria, perhaps slight febrile excitement. They vary in kind and degree in different individuals, and are generally relieved by the flow. The first few periods are apt to be irregular in their recurrence, and the discharge is slight in quantity and composed of mucus with but little blood.

QUANTITY AND QUALITIES OF THE MENSTRUAL DISCHARGE.—The *quantity* of discharge, when the function has become regularly "established," is from one to eight ounces, the average being about five ounces. The duration of the period is from one to eight days, the average being five days, hence average daily quantity during the period, one ounce.

The menstrual blood does not coagulate, owing to admixture with vaginal mucus which contains acetic acid. If the flow be very profuse, coagulation will occur, because the action of the vaginal mucus is then insufficient to prevent it. Mucus of *any* kind, in sufficient quantity, will prevent coagulation.

The discharge also differs at different parts of the period. Toward the beginning and end of the epoch, it contains more mucus and less blood; at the middle of the period *vice versâ*.

SOURCE OF THE FLOW.—That the flow comes from the uterine cavity is absolutely proved by the following facts: it is found there, *post-mortem*, in those who die during menstruation; it is seen to issue from the os externum uteri in cases of procidentia of the organ; it has been seen oozing from the uterine mucous membrane in cases of inversion of the womb; and when there is mechanical obstruction of the os uteri the menses do not appear, but accumulate and distend the uterine cavity.

VICARIOUS MENSTRUATION.—This is a flow of blood from some other organ recurring at the monthly periods, and taking the place of menstruation. It may occur from the hemorrhoidal vessels, the lungs, the skin, the nails, the mammary glands, ulcerated surfaces, and many other parts.

PERIODICITY.—The monthly recurrence of menstruation is accounted for only in so far as ovulation explains it. The interval sometimes varies from the typical twenty-eight days, but it is then, strangely, some multiple of a week.

NORMAL SUSPENSION OF MENSTRUATION.—It is temporarily suspended during pregnancy and lactation, and ceases permanently after the so-called "change of life" at about forty-five or fifty years of age. Numerous exceptions must be noted to each of these statements.

CHAPTER VI.

FECUNDATION AND NUTRITION OF THE OVUM.

FECUNDATION (OR IMPREGNATION) is the union of the germ-cell (ovule) with the *spermatic fluid* of the male.

The *spermatic fluid* (sperm, semen, seminal fluid) is a whitish viscid fluid secreted by the genital glands of the male. Floating about in it are millions of histological elements resembling ciliated epithelium cells, called *spermatozoa* (spermatozoids). By waving of its long cilia the spermatozoid moves about, at a rate, it is estimated, of one inch in seven and a half minutes —a faculty which it may retain for eight or ten days after being introduced into the female genital organs, and upon which the fecundating power of the semen chiefly depends. When brought in contact with the germ-cell, the spermatozoa get into the ovule by penetrating the vitelline membrane. This union may take place either in the ovary, Fallopian tube, or uterus. The natural receptacle for the semen (receptaculum seminis), in the act of coition, is the cavity of the uterus, whither it is conducted by the five or six successive ejaculatory jets on the part of the male organ, and the five or six successive suctional aspirations on the part of the os and cervix uteri that occur when the orgasm is complete in both sexes, simultaneously. It afterward goes on through the Fallopian tubes to the ovaries; though it is not at all improbable that the tubes also become the recipients of semen during the sexual orgasm, or during the few hours embracing several successive sexual acts. Hence theoretical speculations based upon the alleged fact that it requires eight days for the ovule to pass along the tube to the uterus *before it can become impregnated* cannot be sustained. Tubal pregnancies directly negative this supposition.

CHANGES TAKING PLACE IN THE GERM-CELL AFTER FECUNDATION.—It should be remembered the germinal vesicle and germinal spot disappear before, or very soon after the cell leaves the ovary, so that we have nothing left to deal with in this description but simply the vitelline membrane and its contained granular vitellus. Then begins division of the vitelline *mass* (not of the vitelline *membrane*) into two halves, in each of which appears a nucleus. The halves divide into quarters, the quarters into eighths, these into sixteenths, and so this dichotomous subdivision continues, the resulting parts each developing a nucleus, until eventually a great number of minute cells result, which soon arrange themselves, close to each other like bricks in a wall, upon the inner surface of the vitelline membrane. The cells thus in close apposition with each other constitute a membrane, the "*blastodermic membrane*," or, more exactly named, the *external* blastodermic membrane ("*ectoderm*," or "epiblast," or "serous layer") for a second one soon appears lining its interior, called *internal blastodermic membrane* ("entoderm," or "hypoblast," or "mucous layer"). Between these two, there is subsequently developed a third, or *middle blastodermic membrane* ("mesoderm," or "mesoblast," or "vascular layer"), which, later, separates into two concentric strata. Exactly what organs are developed from each of these four layers is as yet unsettled, but recent investigation would seem to warrant the following arrangement:

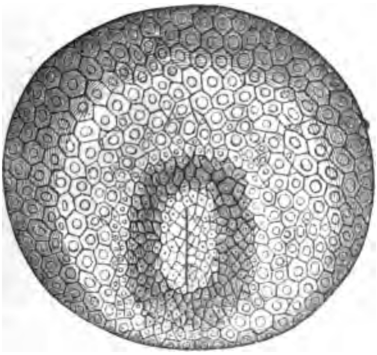
1. The *Ectoderm* contributes to form the epidermis and its appendages, the nervous system, and organs of special sense.
2. The *Mesoderm* (its outer layer) forms the skeleton, the muscles, and the corium.
3. The *Mesoderm* (its inner layer) forms the blood, blood-vessels, blood-glands, together with the muscular and fibrous tissue of the digestive tract, and the genito-urinary organs.
4. The *Entoderm* forms the epithelial lining and glands of

the intestinal tube. The vitelline membrane still surrounds and encloses all of these.

In now studying the development of the ovum, it must first be understood that all the changes to be related take place *inside the vitelline membrane,* which, though extremely thin, delicate, and soft, really plays the part of a sort of eggshell, inasmuch as it contains all the other structures of the embryo with which we have to deal. Moreover, the vitelline membrane does not break until the end of pregnancy, though, as we shall see, it becomes lost by extreme attenuation, and by amalgamation with other membranes lining its inner surface.

If now, at a very early stage of development, we suppose the vitelline membrane to be cut open and removed artificially, it would bring into view the *outer* surface of the *external blastodermic membrane* (the "epiblast," "ectoderm," or "serous layer" already mentioned). At a certain point on this surface there begins to appear an oval-shaped patch or area, differing in color from the surrounding surface owing to closer aggregation of its cells, called the *area germinativa.* Its central portion appears lighter and more transparent than the rest: it is the *area pellucida.* Along the longitudinal axis of this last, a streak or furrow appears—the so-called *primitive trace*—which is the beginning of the spinal canal. (See Fig. 10.)

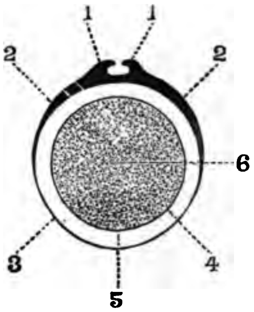
FIG. 10.



External surface of epiblast, showing area germinativa, area pellucida, and primitive trace.

Let us next suppose an incision to be made transversely across and completely through the little globular-shaped ovum, at right angles to the line of the primitive trace. The cut surface thus brought to view will exhibit, at a rather later stage of evolution, a section of the *dorsal plates*, and the *abdominal plates.* The dorsal plates (*laminæ dorsales*) are simply the lateral edges of the primitive trace, which grow upward and arching over at their borders, join each other, and thus convert the furrow of the primitive trace into a canal—the spinal canal. At the same time, from the bases of the dorsal plates there begin to project, in a forward direction, two other plates, which arch toward each other and finally join to enclose the abdominal cavity; these are the abdominal plates (*lamina abdominales*). (Fig. 11.)

FIG. 11.



1, 1. Dorsal plates. 2, 2. Abdominal plates. 3. Epiblast not yet covered by abdominal plates. 4. Hypoblast. 5. Space to be occupied by mesoblast. 6. Vitellus, or yolk.

The *internal* blastodermic membrane containing the vitellus, is of course within the *external* one, while between these will soon be developed the mesoblast. (Fig. 11.)

THE UMBILICAL VESICLE.—The abdominal plates in growing forward, as just stated, do not project far enough to embrace *all* of the globe of the internal blastodermic membrane, but come together half-way over, as it were, so as to indent the hypoblast and thus leave part of it protruding, like a sort of hernial sac, outside the abdominal wall; this excluded portion is the *umbilical vesicle.* The cavity of the umbilical vesicle still communicates with the cavity of that portion of the hypoblast which *is* embraced by the abdominal plates, and which eventually forms the intestinal canal. The channel of communication is called the *vitelline duct.* On the surface of the umbilical vesicle may soon be seen an artery, vein, and intermediate capillaries—the *omphalo-mesenteric* artery and vein—the existence of which presupposes that a rudimentary heart and vascular system have already formed from the mesoblast, for these omphalo-mesenteric vessels are continuous with those inside the abdomen which eventually constitute the portal system of vessels. It should here be noted that the bloodvessels of the *umbilical vesicle* are quite distinct from those of the *umbilical cord,* which last are formed in a different manner from the root of the *allantois,* as described further on.

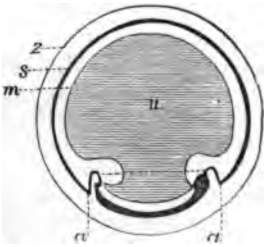
I have said the abdominal plates come together " half-way-over " so as to pinch the hypoblast and exclude the part forming the umbilical vesicle. The point of constriction, however, is by no means in the middle of the hypoblast, for the umbilical vesicle is at first very much larger than the smaller part included in the abdominal cavity to form the alimentary canal. (See Figs. 13, 14, 15, pages 70, 71.) The nutrient matters contained in the umbilical vesicle serve for the early nourishment of the embryo, but this source of supply will shortly become exhausted, for the vesicle grows smaller and smaller, and is finally reduced to an elongated stalk, with the merest remnant of a vesicle on its distal extremity, and which may still be discovered by careful dissection underneath the sheath of amnion that covers the umbilical cord, later in pregnancy, as will be seen hereafter.

When the nutrient contents of the umbilical vesicle have all been used up, it is evident some other source of nutrition for the embryo must be supplied. This we shall now find to be provided by the development of the *amnion, allantois, chorion,* and *placenta,* which indeed has already begun and considerably advanced before the contents of the vesicle have disappeared.

THE AMNION, ALLANTOIS, AND CHORION.—The arrangement and development of these membranes will be best exhibited by now supposing a section of the ovum to be made in a *longitudinal* direction—*i. e.,* along the line of the primitive trace, or spinal column. (See Figs. 12, 13, 14, 15, pages 70, 71, which present views of the supposed cut surface.)

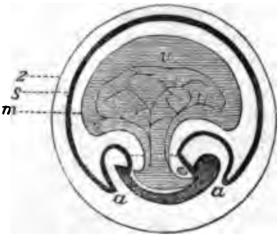
The first structure to begin its development is the *amnion*. It commences as follows: A sort of hollow pouch, fold, or duplication of the epiblast projects near the caudal end of the fœtus, and another one like it near the cephalic end. They bend over toward the back of the fœtus (which has now become curved and convex externally) until they meet and touch each other. In the meantime they have spread and widened laterally, so that the dorsal aspect of the fœtal body is now

FIG. 12.



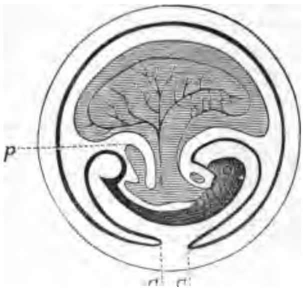
a, *a*. Projecting folds of amnion. *z* Zona pellucida, or vitelline membrane, *s*. Epiblast, or ext. blastodermic membrane. *m*. Hypoblast, or int. blastodermic membrane. *u*. Umbilical vesicle.

FIG. 13.



The letters have the same reference as in Fig. 12, only the parts shown are further developed.

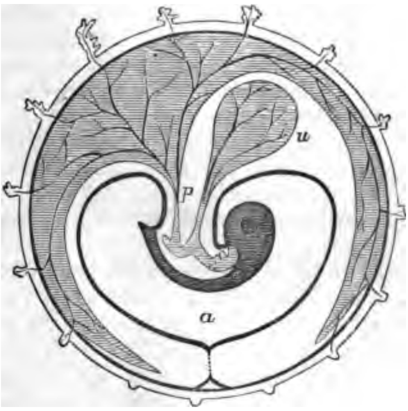
FIG. 14.



Development still more advanced. *a*, *a*. Folds of amnion about to touch and join each other. *p*. Commencement of allantois.

completely enclosed by this double hemispherical fold of amniotic membrane. Where the two meeting folds touch each other, the double septum so formed breaks down and melts away along its centre, while the contiguous *edges* of the two meeting layers join each other; thus a free space is made between the former hollow cavities of the two approaching folds, while the union of the two inner layers has formed the *internal amnion*, and that of the two outer layers the *external amnion*, which are thus separate from each other.

FIG. 15.



Showing junction of amniotic folds at *a*. *u*. Umbilical vesicle. *p*. Pedicle of allantois. The projecting folds of the allantois, passing round the embryo, and following the folds of the amnion, will soon join and unite, completely surrounding the ovum.

The external peripheral surface of the *outer* amniotic layer comes in contact with the vitelline membrane, and these two weld or amalgamate together to form a single membrane, while the *internal* layer of the amnion becomes distended with fluid (*liquor amnii*), and, growing larger and larger during pregnancy, fills the womb, and constitutes one of the membranous strata composing the "bag of waters" that bursts in labor.

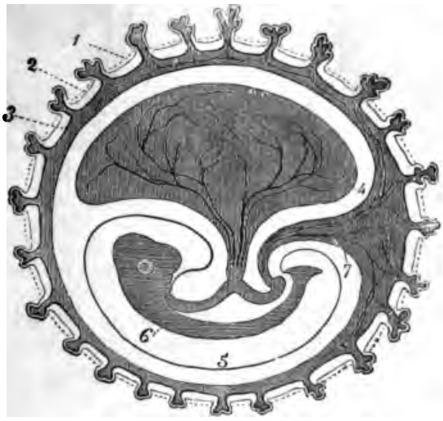
THE ALLANTOIS AND CHORION.—The allantois begins as a membranous vascular pouch springing from, and continuous with, the lower part of the intestinal mucous membrane. It follows inside the space of the hollow amniotic pouch, and, like it, widens, spreads laterally, and eventually its two progressively extending margins meet and join each other, so that the fœtal body is now enclosed completely in a layer of *allantois,* which, from the nature of its place of origin, is, of course, situated between the internal and external layers of the amnion. The root or neck of this allantoic membrane becomes, and in fact already is in a rudimentary form, the umbilical cord or navel string. Later on, the cavity of the allantois becomes obliterated, by the disappearance of its contents, and by its two opposing folds or walls adhering and uniting along their internal surfaces to form one layer, which comes in contact with the inner concave surface of the external amnion and amalgamates with it. Thus the external amnion has the vitelline membrane on the outside of it, and the allantois on the inside. The three amalgamated together, as they now are, compose a single membrane which receives henceforth the name of "*chorion.*"

The chorion afterward becomes covered externally with projecting villi, not unlike those of the adult small intestine, each of which, later on, receives a capillary vascular loop derived from what were originally the vessels of the allantois. The *villi* of the chorion, covered with epithelium externally, and containing the bloodvessels in their central axes, grow longer and branch out at their distal extremities, this process being more complete and complicated in that part of the chorion which is to participate in forming the future placenta.

The projecting, dangling villi of the chorion (often termed its "shaggy coat") give the ovum, when examined post mortem, the appearance of a little bunch of wet, whitish, gelatinous moss. After eight weeks, the villi over a greater part of the chorion disappear—this part is said to become *bald*—while about one-third of the surface retains its villi, and the latter become developed more and more, to form, as we shall see presently, the placenta.

Since the amnion, as thus far explained, seems only to envelop the dorsal aspect of the fœtus, some further explanation is necessary in order to understand how the *whole body* of the child eventually floats (as it were, tethered by its navel string) in an amniotic bag that *completely* surrounds it. This explanation is as follows: The elastic amnion becomes more and more distended with fluid (the liquor amnii) and the two ends of the sac yielding to this distention, gradually swell toward each other, as if rolled along the anterior surface of the fœtal body, until they meet on the abdomen, with nothing but the umbilical cord and the remains of the umbilical vesicle between them. The wide rounded ends of the amnion that thus meet over the abdomen are continuous with the integument of the fœtus, and after contributing a sheath to the umbilical cord, as just stated, go on to join the reflected layer already described as covering the dorsal aspect of the fœtus.

FIG. 15a.



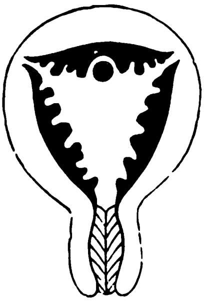
Showing folds of allantois completely united, and their two layers in contact with epiblast and vitelline membrane, to form chorion, with its villi. 1. Vitelline membrane. 2. Epiblast. 3. Allantois. 4. Umbilical vesicle. 5. Amnion (its internal layer, containing liquor amnii). 6. Body of fœtus 7. Pedicle of allantois, to become the umbilical cord.

To recapitulate the several structures with which the fœtus is surrounded, as thus far described, and proceeding *from within outward*, they are as follows:

1. The *amnion*—*i. e.*, the *inner layer* of the amnion, containing the liquor amnii, in which the fœtus floats.
2. The *allantois.*
3. The *external layer of the amnion.*
4. The *vitelline membrane.*
5. The three last-named membranes weld together to form the *chorion.*

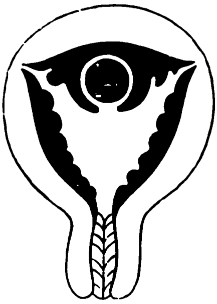
CHANGES IN UTERINE MUCOUS MEMBRANE. FORMATION OF DECIDUA, ETC.—While the changes thus far described have been going on in the ovum, others have also taken place in the uterus, especially in the *uterine mucous membrane.*

FIG. 16.



Formation of decidua vera, which is represented by black coloring.

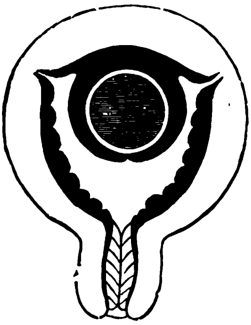
FIG. 17.



Formation of folds of decidua reflexa growing up around ovum.

The increased vascularity, hypertrophic thickening, and shallow folding of the uterine mucous membrane, which, we

FIG. 18.



Joining of folds of decidua reflexa around ovum, and thickening of decidua serotina where the placenta will develop.

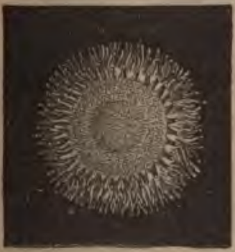
have seen, begin, preparatory to ovulation, at each menstrual period, progress, after the stimulus of impregnation, with a sort of almost paroxysmal rapidity. The membrane becomes extremely thick, vascular, and deeply convoluted (except near the orifices of the Fallopian tubes and os internum), so as to obliterate, or rather *fill*, the cavity of the womb. The hypertrophied mucous membrane thus formed on all sides of the uterine cavity is called the *decidua vera*.

When the ovum first enters the womb it lodges between two of the folds of the decidua vera, and, imparting an extra stimulus to those portions of this membrane immediately surrounding it, they grow up all round the ovum, and, being reflected over it, meet and join together, thus, as it were, burying the little germ in a circular grave of mucous membrane, the arched covering of which is the *decidua reflexa*. That part of the decidua vera which lies *between* the ovum and the uterine wall (the *bottom* of our imaginary grave) is the *decidua serotina*. This becomes greatly thickened, and constitutes the bed into which the rootlets of the chorial villi penetrate to form the future placenta.

Thus the fœtus is finally enveloped by *three* membranes, viz.:

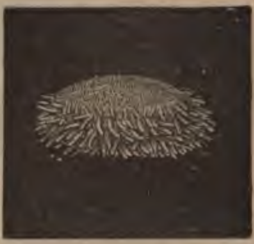
1. The inner layer of the amnion, in future simply called "THE AMNION," for the outer amniotic layer, as we have seen, has lost its identity in becoming amalgamated with the allantois and vitelline membrane to form,
2. THE CHORION,
3. THE DECIDUA REFLEXA.

FIG. 19.



Showing front view of Reichert's embryo. × 4.

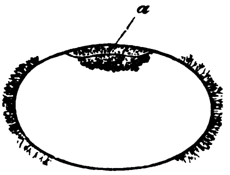
FIG. 20.



Showing side view of Reichert's ovum. × 4.

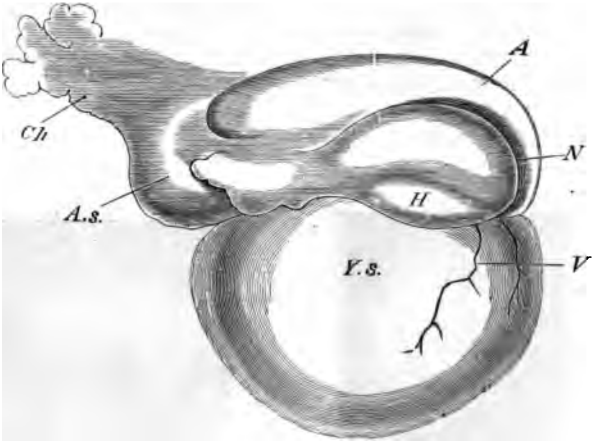
These three membranes persist until delivery, constituting the several layers of the *bag of waters*. In the progressive development of pregnancy, the external surface of the amnion comes in contact with the internal surface of the chorion; the external surface of the chorion in contact with the internal surface of the decidua reflexa; the external surface of the decidua reflexa in contact with the decidua vera, covering the remaining parts of the uterine walls.

FIG. 21.



The same in diagrammatic section (His). × 5. *a.* Area germinativa.

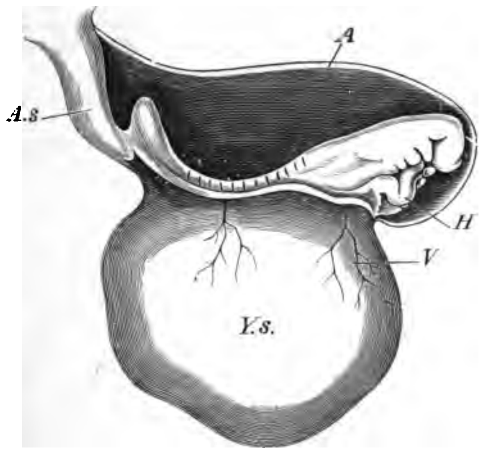
FIG. 22.



His's ovum, seen from right side. × 20. *A.* Amnion. *A. s.* Allantois connecting with *Ch.*, a part of the chorion. *H.* Heart. *V.* Bloodvessels of *Y. s.*, yolk sac, or umbilical vesicle. *N.* Neural groove for spinal canal.

Before proceeding to describe the formation of the placenta, it may be well to understand that our knowledge of the earlier stages of embryonic evolution has been derived almost entirely from examination of the embryos of other animals. Disappointing as it may be, it is nevertheless true, that but very few human ova have been seen during the first two or three weeks after impregnation; during the *first* week *none*; during the *second* and *third* weeks only a limited few; and, moreover, these differ in some considerable degree from the ova of other organisms, still we must infer they are developed upon the same general plan. Reichert's ovum, supposed to be thirteen days, old, and represented four times its natural size in Figs. 19 and 20, was found in the womb of a woman who committed suicide. It was flattened from side to side, something like a biconvex lens, the surface facing the decidua reflexa (shown in Fig. 20) being more convex than the other. Fringes of villi projected only from its borders, the central portions of both surfaces being bald and circular, that toward the uterus exhibiting also a smaller circular central space. It contained no trace of a fœtus.

FIG. 23.

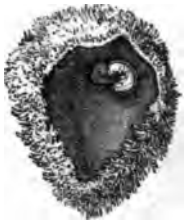


Human ovum during third week. *A.* **Amnion.** *A. s.* **Allantoic stalk.** *H.* **Heart.** *V.* **Bloodvessels of** *Y. s.*, **the yolk sac, or umbilical vesicle. (From His, after Coste.)**

A human ovum, fourteen days old, with embryo magnified twenty diameters, and obtained by His, is shown in Fig. 22.

Another human ovum, between fifteen and eighteen days old, as described by Coste, is shown in Fig. 23, largely magnified.

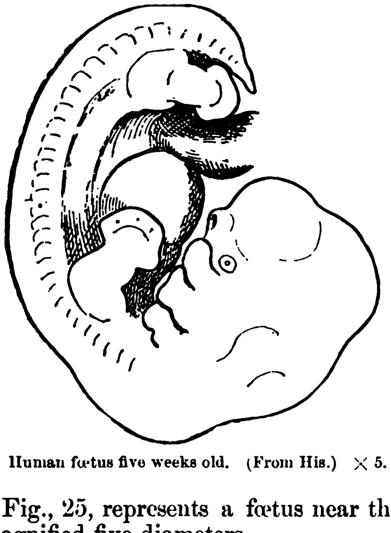
FIG. 24.



Human ovum, with contained embryo, about the end of third week (From Kölliker, after Allen Thompson.)

At the end of the third week the whole ovum is covered with chorial villi, and on cutting it open the embryo may be seen as represented, of natural size, in Fig. 24.

FIG. 25.



Human fœtus five weeks old. (From His.) × 5.

The next Fig., 25, represents a fœtus near the end of the fifth week, magnified five diameters.

THE PLACENTA.—The placenta at full term is a soft, spongy mass, irregularly saucer-shaped, seven or eight inches in diameter, three-quarters of an inch thick near the centre, and from one-eighth to one-fourth of an inch at the edge; average weight, twenty ounces. It varies much in all these particulars.

It begins to be formed about the end of the second month of gestation, and attains its essential characteristics in a few weeks more.

The *exact* mode of its development, its minute structure, and the *precise* relation of its bloodvessels with those of the fœtal vessels in the chorial villi, are matters regarding which there still remains great uncertainty. It may be sufficient for practical purposes to understand the following leading matters of fact about which there is no doubt, viz.: 1. The chorial villi, with their loops of bloodvessels, penetrate, like the roots of a tree, the thick decidua serotina. 2. The decidua serotina is also penetrated from its uterine surface by bloodvessels continuous with the curling arteries of the uterine wall. 3. At first the external coats of the villi and the mucous coat of the decidua serotina intervene between these two sets of bloodvessels, but later on these intervening soft structures are absorbed, and then the bloodvessels of the chorial villi (fœtal vessels) come directly in contact with the bloodvessels of the decidua serotina (maternal vessels). 4. Wherever this contact occurs, the coat of the maternal vessels unites with the coat of the fœtal vessels to form one membrane, and this last, growing very thin, still always remains as a membranous septum between the maternal and fœtal blood, and through it all the interchanges of matter between mother and child take place.[1] 5. The two bloods never mix. On the contrary, the blood sent to the villi by fœtal arteries returns by fœtal veins, and that sent to the placenta by maternal arteries returns by maternal veins. 6. The two sets of bloodvessels do not come in contact with each other along any definite straight line, but at first the capillary loops, and later their branches, decussate with each other (like the surfaces of two apposed cogged wheels); and still later, the two sets of branching vessels are confusedly united and irregularly interlaced and entangled with each other in a "most admired disorder," too complicated for brief description; yet while the vessels tangle and adhere, the bloods never mix. The whole substance of the placenta is eventually made up of these two sets of vessels and their contents.

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[1] The coalescence of the maternal placental vessels, by absorption of their apposing walls, to form larger vessels (placental sinuses) is still a matter of doubt.

THE UMBILICAL CORD (navel string, funis).—At first it is the root of the allantois, or that portion of the allantois extending from the body of the fœtus to the chorion. Later it remains the connecting link between the abdomen (navel) of the fœtus and the placenta. It contains two arteries which are continuations of the fœtal hypogastric arteries, and one vein—the latter without valves. The umbilical arteries, at first straight, become, later, twisted round the vein. The vessels are embedded in the so-called gelatin of Wharton, and the cord is covered externally by a layer of the amnion.

NUTRITION OF FŒTUS AT DIFFERENT PERIODS OF PREGNANCY.

1. At first it absorbs nourishment simply through the vitelline membrane. 2. The vitellus is absorbed and carried into the body of the fœtus by the branches of the omphalo-mesenteric vessels. 3. The chorial villi absorb nutriment which is conveyed to the fœtus by bloodvessels springing from the vascular allantois. 4. When a larger number of the villi have disappeared, the remaining (one-third) of the chorial tufts develop into the placenta.

FUNCTIONS OF THE PLACENTA.—It not only *affords nutriment* to the child, but is also its *respiratory organ.* The umbilical arteries carry blue (venous) blood to the placenta, where carbonic acid gas is given off to the maternal blood and oxygen taken in from it, so that the umbilical vein brings back arterial (red) blood to the fœtus. The placenta is also an *organ of excretion* for the infant. Hence compression and obstruction of the cord kills the child.

FŒTAL CIRCULATION.—The umbilical vein after entering the umbilicus sends two branches to the liver, while its main trunk (the *ductus venosus*) empties directly into the ascending vena cava. The blood returned from the placenta by the umbilical vein goes, therefore, part of it to the liver, whence it is returned by the hepatic veins into the ascending vena cava just above the entrance of the ductus venosus to join the current from this latter vessel. The blood from the lower extremities of the fœtus comes up through the vena cava and thus mixes with the returned blood from the placenta.

The ascending vena cava pours its blood into the right auricle of the heart, where it is directed by the *Eustachian valve* through the *foramen ovale* into the left auricle. From the left auricle it goes to the left ventricle; from the left ventricle to the aorta. The great bulk of this aortic stream passes through the large arterial branches of the aortic arch to the head and upper extremities. From these the blood returns by the descending vena cava to the right auricle; from thence through the tricuspid valve it passes into the right ventricle; and then it enters the beginning of the pulmonary artery, but the two branches of the pulmonary artery going to the lungs cannot receive this column of blood before respiration is established, so that there is a special blood-duct (the *ductus arteriosus*) provided for carrying the stream from the trunk of the pulmonary artery into the descending aorta, from whence part goes to the lower extremities, to come back by the ascending cava, while the larger portion passes along the umbilical arteries to the placenta. The umbilical arteries are continuations of the hypogastric arteries given off from the internal iliacs.

✓ Changes Taking Place in the Circulation after Birth.—There is no longer any current of blood through the umbilical vessels. The navel string dries up and falls off. The umbilical arteries *inside* the abdomen remain permanent in a part of their course, constituting the *superior vesical arteries.* The ductus venosus and ductus arteriosus no longer admit blood, but shrivel up into fibrous cords. The foramen ovale closes, so that there is no longer any passage from one auricle to the other, and when the lungs are expanded by respiration, the pulmonary arteries receive the blood which before went through the ductus arteriosus, and convey it to the lungs.

CHAPTER VII.

THE SIGNS OF PREGNANCY.

THE signs of pregnancy require particular and careful study, for several reasons:

(1) Because unskilled persons very often, and the most skilful physicians sometimes, make mistakes in stating that pregnancy exists when it does not, or *vice versâ*. (2) The question of pregnancy may involve character, as in unmarried females. (3) It may involve the legal rights of offspring. (4) It determines medical, surgical, and obstetrical procedures often of the gravest import. (5) It concerns the reputation of the physician.

CLASSIFICATION OF SIGNS.—They have been divided into *presumptive*, *probable*, and *positive*, according to the degree of reliance to be placed in them as evidence of pregnancy. They have also been called *rational*, or such as are evident to the sensations of the patient; and *physical*, such as become apparent to the educated physician by physical examination. Probably the most practically useful method is to divide them into those that *are* certain and those that are *not*: hence, *first*, *Positive signs*; *second*, *Doubtful signs*.

The duration of pregnancy in the human female is forty weeks, or two hundred and eighty days; or ten months—*i. e.*, ten *lunar* months. But it may be best to discard the term "month" altogether, inasmuch as an additional word is required to indicate whether it means a lunar or a calendar month.

HOW EARLY DURING THIS PERIOD IS IT USUALLY POSSIBLE TO MAKE A POSITIVE DIAGNOSIS OF PREGNANCY IN DOUBTFUL CASES WHERE IMPORTANT INTERESTS ARE INVOLVED?—It cannot be far from true to assert that scarcely half the physicians in the world (to draw the line roughly) are sufficiently skilful to make a positive diagnosis in such cases before the pregnancy is nearly half over. Even the most skilful can hardly obtain absolutely positive signs during the first sixteen weeks.

But little reliance can be placed upon the statements of the woman herself. Without being consciously untruthful, she may be deceived by her own sensations; and in other cases wilfully mislead the examiner, even denying the *possibility* of pregnancy almost up to the time of delivery.

POSITIVE SIGNS.—There are only *three* signs that are *absolutely* positive, viz.:

1. The fœtal heart sound.
2. Quickening or active motions of the child.
3. Ballottement or passive locomotion of the child.

Two others, though not so valuable, are usually classed with the positive signs, viz.:

4. The uterine murmur.
5. Intermittent contractions of the uterus.

THE FŒTAL HEART SOUND.—The pulsation of the heart can seldom be heard before the twentieth week (the middle of pregnancy). A practised, skilful ear *may* recognize it two or three weeks earlier. As pregnancy advances, the sound gets louder and more easy of recognition, resembling that made by the ticking of a watch heard through a feather pillow. A good imitation of it may be produced by pressing the palm of one hand strongly against the ear, while on the back or cubital border of it, a series of gentle touches, in quick succession, are made with the tip of the middle finger of the other hand, previously moistened with saliva; or a beginner may learn the sound by listening to the heart of a newborn child.

Owing to the flexed posture of the child the sound is transmitted through its *back*, which is in closer contact with the uterine wall than are the other parts of the infant's thorax. The back of the child usually lies against the lower part of the uterine wall on the left side. We listen for the sound, therefore, on the abdomen of the mother about the middle of a line drawn from the umbilicus to the centre of Poupart's ligament on the left side, or the region thereabouts. Failing to hear the sound there, the same region on the right side may be examined, and, if again failing, the whole surface of the abdomen may be explored.

In auscultation of the abdomen a stethoscope is used (the double one preferred), or the ear alone, one thin layer of clothing covering the surface in the latter method for the sake of delicacy. Selection determined by the custom or judgment of the practitioner. The patient must lie upon the back, and the room be kept quiet.

Failure to hear the heart sounds during the later months does not positively negative the existence of pregnancy, for the child may be dead; or the heart sounds may be very feeble; or thick tumors, etc., may intervene between the uterine and abdominal walls, interfering with the transmission of the sound; or the auscultator's ear or skill may be at fault.

The *frequency* of the fœtal heart sound bears no relation with that of the mother's heart. They are independent of each other. The fœtal heart beats from one hundred and thirty to one hundred and fifty times a minute. It is generally a little less frequent in large children than in small ones. Very large children are usually males. Hence, attempts have been made to determine the sex before birth by the heart sounds, but little reliance can be placed in the method.

It is barely possible to mistake the sound of the mother's heart for that of a child in utero, as when, *ex. gr.*, the mother's heart, from fever or other causes, attains the same frequency as that of the infant; but this mistake could be avoided by noting if the mother's pulse beat *simultaneously* with the abdominal sounds.

When the sounds of the pulsations of the fœtal heart are distinctly heard, while the womb is found too small to contain a fœtus of sufficient size to yield a heart sound, and especially if the womb is but little larger than an unimpregnated one, it indicates *extrauterine* fœtation.

QUICKENING.—This term *originated* from the erroneous supposition that the child became "*quick*," or alive, only after it began to move. It simply *means* active muscular motions of the child's limbs or body. The period at which fœtal movements may be first recognized varies very much; but to make a practical statement, and one easy of recollection, we may say *about the middle of pregnancy*. Then, and after then, an obstetrician of ordinary skill may feel the motions of the child, but the mother may be cognizant of certain sensations in the abdomen (described as "fluttering," "pulsating," "creeping," etc.), which she calls "feeling life," as early as the sixteenth or eighteenth week. Occasionally in examining the abdomen the physician, at this early period, or even before, may feel or hear with the stethoscope certain motions, which he *supposes* are fœtal movements, but these are scarcely reliable.

In examining the female for fœtal motions she may be either standing, sitting, or lying upon her back with the thighs flexed so as to relax the walls of the abdomen. One hand is then pressed with gentle firmness upon the abdominal wall and uterus, and kept there for some minutes. Should the motions not be felt, pressure or gentle taps may be made with the other hand upon other parts of the abdominal surface. Dipping the hand in cold water before placing it on the abdomen will sometimes excite fœtal movements.

When violent, the motions produce distortions and projections of the abdominal wall, that may be *seen* as well as felt.

Failure to recognize these movements does NOT negative the existence of pregnancy; the child may be dead, or it may retain life and vigor and yet fail to move, even during the physician's examination.

Contractile muscular motions in the abdominal, uterine, or intestinal walls; the movement of gas in the intestinal canal; and the pulsations of aneurisms and large arteries, may, it is just possible, be mistaken for fœtal movements by the inexperienced.

BALLOTTEMENT—PASSIVE LOCOMOTION OF THE FŒTUS—is a sudden locomotion of the child in the uterine cavity, *produced* and felt by the physician.

METHOD OF EXAMINATION.—The woman is placed in a position which will make the child settle, by gravitation, toward that part of the uterus where the examining finger is to be applied *per vaginam*. The best plan is to let her sit on the edge of a low bed and then lean back against pillows, so as to be midway between sitting and lying. The finger is now introduced and placed in front of the cervix close to its junction with the body of the womb. The other hand steadies the fundus uteri. A sudden upward, jerking, but not violent, motion, is now executed by the examining finger, which will cause the fœtus to bound slowly upward to the fundus, and as it comes back again the finger will feel it knock against the neck (so to speak) of the uterine bottle in which it floats. The manipulation may be repeated several times to insure certainty. The position may be changed to a lying or standing one, and the finger put behind the cervix uteri, if the first examination is not satisfactory.

If the abdominal walls are thin, *external ballottement* may be performed. The woman lies on her side, the abdomen slightly over the edge of the bed, and with a hand on each side of the womb the operator endeavors to move the fœtus up and down for the purpose already indicated.

Ballottement may be recognized earlier than any other of the positive signs, viz., from about the fourteenth or fifteenth week, and until within six or eight weeks of full term.

Toward the end of pregnancy the child so nearly fills the uterine cavity that it cannot be moved about. In multiple pregnancies, or where there is deficiency of the liquor amnii, the sign is unavailable for the same reason. The child may also be immovable when it is lying crossways in the womb. Again, the operator may lack skill and acute tactile sensibility. During the first part of pregnancy the child is too light in weight to be felt with the finger through the uterine wall.

A calculus in the bladder; exaggerated flexion of the uterus; and a pediculated subperitoneal fibroid tumor of the uterus, are the only conditions likely to produce results, on examination, resembling *ballottement.*

THE UTERINE MURMUR.—This has been called *placental murmur*—placental souffle, or *bruit placentaire*—because it was thought to be produced by blood rushing through the "placental sinuses;" *uterine souffle* or murmur, on the supposition of its being caused in the same way in the *sinuses of the uterine wall; abdominal souffle*, because it was believed to occur from pressure of the gravid womb upon the large vessels of the abdomen. It has also been referred to blood changes, like those occurring in profound anemia; and it is said a somewhat similar sound has been produced by pressure of the stethoscope upon the epigastric artery in the abdominal wall.

These theories are still unsettled. The one most generally received is that which refers the sound to the *uterine* blood-channels. The murmur has been heard after complete delivery of the placenta; and there is no substantial proof of its production in the vessels of the abdomen.

The most striking peculiarities of the uterine murmur are as follows:

1. It is a maternal sound synchronous with the mother's pulse; 2. It is remarkably capricious or coquettish in character, changing often in tone, pitch, intensity, duration, and location, even while we listen, or it may be absent and again return; 3. It becomes stronger at the beginning of a labor-pain, ceases altogether at the acme of the pain, returns loud again as the pain goes off, and after that, resumes the character it had before the pain began.

It is most usually recognized near the lower part of the abdomen, and necessarily so when first audible, because the womb does not yet extend high up in the abdominal cavity. Toward the end of pregnancy it may be heard, of course, higher up. It cannot generally be recognized before the *sixteenth week*, except by ears exceptionally acute and skilled. It remains afterward till full term, unless temporarily absent as before explained. It is not an *absolutely* positive sign of pregnancy, because a sound resembling it may be heard in large fibroid tumors of the uterus, ovarian tumors, and other conditions.

INTERMITTENT UTERINE CONTRACTIONS.—From about the twelfth week of pregnancy (when the womb has grown sufficiently large to be felt by the hand through the abdominal wall), until its termination, the uterus is constantly contracting at intervals of a few minutes. If the hand steadily grasp the fundus uteri, and remain so doing for from five to ten or fifteen minutes, it will feel the womb hardening (by contraction) and relaxing again at intervals, in a very characteristic manner. Though a valuable sign, from the early period at which it may be recognized, it is not an *absolutely positive* one, because the uterus may contract in a similar manner in its efforts to expel blood-clots, polypi, retained menses, fibroid tumors, and other products not connected with pregnancy. It is of great diagnostic value, however, as a corroborative sign when considered in relation with the history of the case.

ADDITIONAL PHYSICAL SIGNS.—In addition to the foregoing five positive signs, auscultation may reveal one or two others of less value. These are: 1. The *funic* or *umbilical souffle*—an intermittent hissing sound, synchronous with the fœtal heart, supposed to come from the umbilical arteries, when the funis is coiled round the child's body or neck. 2. The "*fœtal shock*"—this conveys to the ear a combined sensation of shock and sound, and is probably produced by the pressure of the stethoscope moving the fœtus passively. It is *ballottement* recognized by the *ear*, instead of the *finger*. 3. Sounds produced by *active* motions of the child. It is "*quickening*" recognized by the *ear* instead of the *hand*. This last is of some value, since it may be occasionally recognized earlier than the other auscultatory signs,—viz.: by the end of the twelfth week. Neither of these three additional signs, however, is comparable, in practical value, with the five previously mentioned.

DOUBTFUL SIGNS OF PREGNANCY.—These are difficult to define numerically, but for convenience of recollection we may enumerate *five* that are easy of recognition, and *five* others that are somewhat less so. Each of these ten signs, however, includes a variety of phenomena. They are as follows:

First Five.

1. Suppression of the menses.
2. Changes in the breasts and nipples.
3. Morning sickness.
4. Morbid longings and dyspepsia.
5. Changes in the size and shape of the abdomen.

Second Five.

6. Softening and enlargement of os and cervix uteri.
7. Violet color of vagina.
8. Kiestein in the urine.
9. Pigmentary deposits in the skin.
10. Mental and emotional phenomena.

Besides these there are a few residual odds and ends by which the list of gestation signals may be completed.

1. SUPPRESSION OF MENSES.—Menstruation is suppressed during pregnancy, because what would have been *menstrual*

blood in the absence of impregnation is now appropriated to the development of the ovum and reproductive organs. There is no ovulation during pregnancy. Suppression of the menses is a very doubtful sign, because, exceptionally, menstruation (and even ovulation) may occur during gestation. Cases are seen, *very* rarely, in which menstruation occurs *only* during pregnancy. Suppression of the menses may take place from cold, mental emotion, and many causes other than pregnancy. Again, the sign may be unavailable in cases where impregnation occurs at puberty, before the menstrual function is established; or during lactation, when it is absent; or in women whose menses are wanting from anemia or debility.

When menstruation occurs during pregnancy, it seldom recurs every month throughout the whole period; more frequently it ceases after the first three or four months. In the latter case the flow is *supposed* to come from that portion of the decidua vera with which the expanding decidua reflexa has not yet come in contact. After the contact named takes place, there is no further menstruation.

2. Changes in the Breasts and Nipples.—The *mammary glands* become firmer, larger, more movable; their blue veins more easily visible; and sensations of weight, pricking, tingling, etc., in them, may be noticed by the patient. There are also a few light-colored silvery lines radiating over the projecting breasts.

The *nipples* become enlarged somewhat, and more distinctly prominent, or erect; and a sero-lactescent fluid oozing from them, dries into branny scales upon their surface.

The *areola,* or disk, surrounding the nipple, gradually becomes darker in color, varying with the complexion of the individual, from the lightest brown tint to black. Upon its surface are seen ten, twelve, or more *enlarged follicles,* which project one-sixteenth or one-eighth of an inch. They vary in size, and contain *sebaceous matter.*

On the white skin *just outside,* but immediately surrounding the colored disk, the *secondary areola* subsequently appears. It consists of round, unelevated spots, of a *lighter color* than the surface on which they rest; hence they are said to resemble spots "produced by drops of water falling upon a tinted surface, and discharging the color." There is one complete row of them placed close together round the dark areola, and other scattering ones a little further off, that are less distinct.

Secretion of Milk.—In a woman who has never been pregnant before, this is considered a very valuable corroborative sign. Milk, in exceptional instances, runs from the breast weeks before delivery, and a drop of lactescent fluid may be squeezed from the nipple as early as the twelfth week of gestation in some cases.

The dates at which these several breast signs appear, are as follows: The *secondary areola* does not become visible till the twentieth or twenty-fourth week; the *silvery lines* do not appear till near the end of pregnancy; and nearly all the other signs on these parts commence from the eighth to the twelfth week, and then become more pronounced as pregnancy goes on.

What degree of certainty can be attached to the breast signs?—They are totally unreliable, taken alone. In conjunction with other early signs they may lead us to suspect the existence of pregnancy, but such a suspicion should not be crystallized into an expressed opinion until more positive signs appear. Their absence does not negative pregnancy.

Conditions resembling them may occur from uterine or ovarian diseases independent of gestation. Many of them continue a long time after delivery, and might thus be erroneously attributed to a supposed succeeding pregnancy. Confusion of this sort arises when pregnancy is suspected during lactation, or after a concealed or unknown abortion. The secretion of milk has been produced artificially, not only in females, but even in males.

In *primiparous women*, the occurrence of the *secondary* areola; the secretion of milk; and the fact of our being able to force a drop of lactescent fluid from the nipple, deserve great consideration, but in multiparæ they must be taken *cum grano salis*. *Suppression* of the milk secretion in nursing women, is of considerable value as a corroborative sign.

3. MORNING SICKNESS.—This consists in nausea, which may or may not be accompanied with vomiting, on first rising in the morning, or it may take place at or after the morning meal.

It usually begins about the fourth or fifth week, and lasts until the end of the sixteenth, or later. Sometimes it comes on a few days after impregnation, and continues throughout pregnancy.

It is a sympathetic disturbance, most likely due to a degree of congestion of the uterus beyond the physiological limit, and for which it is, to some extent, a natural corrective. Sexual excitement after conception is probably a factor in its production.

It justifies the suspicion of pregnancy only when it occurs and persists without any other special cause, and in a woman who is otherwise healthy and well.

4. MORBID LONGINGS AND DYSPEPSIA.—Some pregnant women have an unusual desire for sour apples and other acid fruits, or drinks, and salads prepared with vinegar, etc., or there may be a liking for substances still more unpalatable, such as chalk, ashes, lime, charcoal, clay, and slate pencil; even putrid meats and spiders have composed a part of the chosen *mênu*. Occasionally there is entire loss of appetite, or a disgust for particular substances.

Heartburn, pyrosis, flatulence, and unpleasant eructations are of common occurrence.

These dyspeptic symptoms and morbid longings begin about the same time, and have about the same diagnostic value as morning sickness, and their duration is equally uncertain.

5. CHANGES IN THE SIZE AND SHAPE OF THE ABDOMEN. —During the first eight weeks of pregnancy the abdomen is really flatter than before, and presents no increase in size. This is due to sinking down of the uterus, which pulls the bladder down a little, and the bladder, in turn, by means of the urachus, draws the umbilicus inward, so that the navel and its immediately surrounding abdominal surface appear drawn in, instead of prominent. Hence the oft-quoted French proverb: "*Ventre plat, enfant il y a.*"

"In a belly that is flat,
There's a child—be sure of that."

But you cannot be *suré* of it.

By the twelfth week the fundus uteri begins to rise above the brim of the pelvis, where it can be felt with the hand over the pubes. The navel is still sunken.

At the sixteenth week the fundus has risen about two inches above the symphysis pubis. The navel is no longer unusually sunken.

So the vertical enlargement progresses at the rate of about one and a half to two inches every four weeks, until the fundus, at the thirty-eighth week, almost touches the ensiform cartilage. During the last eight weeks the umbilicus protrudes beyond the surface.

About two weeks before delivery the womb sinks down a little, the abdomen becomes less protuberant at its upper part, and appears smaller in size. This is generally ascribed to relaxation of the pelvic ligaments and soft parts.

We may more easily remember the position of the fundus at different stages of pregnancy by dividing the whole term into thirds, as follows:

At the end of the *first* third the fundus rises a little above the pubes—say it is *at* the pubes.

At the end of the *second* third it reaches the navel.

At the end of the *third* third it reaches the ensiform cartilage, allowing for sinking during the last week or two.

By subdividing the intermediate spaces into thirds and allowing one-third of fundal rise for each four weeks, we shall attain approximate precision sufficient for practical purposes, for there are great differences in different cases.

The principal characteristics by which enlargement of the abdomen from pregnancy may be distinguished from other kinds of abdominal swelling, are as follows: The pregnant womb is usually *symmetrical in shape;* it is *longer vertically* than transversely; its *contour is smooth and even;* it possesses a peculiar *stiff elastic consistency* and may be felt to *contract under palpation.* By careful firm pressure it may also be felt to contain a *movable solid body*—the fœtus. It is not easy to distinguish these peculiarities by palpation of the abdomen. The sense of touch must first be educated by long practice, and even then, in doubtful cases, the *history, origin, duration,* and *accompanying symptoms* of the enlargement, must be fully studied before we can attach to them much diagnostic importance.

Fibroid and other tumors of the uterus; cystic and other tumors of the ovary; distention of the womb from retained menses; accumulations of fluids or gases; obesity; pseudocyesis; enlargement of liver, spleen, and other of the abdominal viscera, etc., may lead to enlargement of the abdomen simulating pregnancy. The history and duration of the swelling, together with accompanying symptoms, should prevent its being mistaken for gestation.

6. **Softening and Enlargement of Os and Cervix Uteri.**—In making a digital examination *per vaginam*, the differences to be noted between a *virgin* uterus, and an impregnated one, are very characteristic; but between the impregnated and unimpregnated uterus of a woman who has already borne children, the differences are less marked.

Scarcely any change takes place during the first few weeks of pregnancy, other than the alteration of position in the womb already noted, together with increased weight and consequent diminished mobility of the organ.

The chief characteristic of the virgin cervix uteri is *firmness* of consistency. Very soon after impregnation it begins to *soften* and *enlarge* circumferentially. The lips of the os externum become wider, and puffy to the touch, and the fissure of the os becomes rounder and larger. The softening begins at the outside (vaginal surface) and lowest part of the cervix and gradually extends upward and inward until the compact nodule of the virgin cervix is converted into a soft elastic projection, whose length is *apparently* shortened by increase of width and diminished resistance to the examining finger.

These changes begin soon after conception, but scarcely become easy of recognition till about the fifth or sixth week. In sixteen weeks the *lips* of the os are softened; in twenty weeks *half the cervix* is soft, and the *whole* of it has undergone the same change when the "term" is within a month of completion.

After one child the cervix never goes back to its pristine virgin firmness, nor does it recover the perfect smoothness of surface and smallness of the external os characteristic of the virgin uterus.

Again, during a first pregnancy the os will not admit the tip end of a finger, during a subsequent one it generally will.

The *diagnostic value of softening and enlargement of the cervix uteri*, is only relative: their *absence* would generally *negative advanced* pregnancy; but as they may occur from other causes, the affirmative evidence they furnish is not reliable.

7. VIOLET OR DUSKY COLOR OF VAGINAL MUCOUS MEMBRANE.—By Jacquemin (who first discovered this sign in examining the prostitutes of Paris) and others, it has been considered to furnish positive evidence of pregnancy, especially during the early months. This is an error. The discoloration is due to venous congestion, and conditions closely resembling it may occur from uterine or vaginal congestion independent of pregnancy; as it can only be observed by inspection, it is not always available.

8. KIESTEIN IN THE URINE.—When the urine of a pregnant woman is kept for some days (it *may* require weeks) at a temperature of about 70° F., a flocculent woolly-looking cloud begins to form in the centre of the liquid, which gradually rises to the surface, like a pellicle of grease on cold broth; and, later, the film breaks up and falls to the bottom of the vessel. This is kiestein. It occurs from the eighth week to the thirty-second, or thereabouts, and then disappears. It is mostly made up of the triple phosphates so often seen in decomposed urine, and is of little diagnostic value inasmuch as it occurs in the urine of men and non-pregnant females.

9. PIGMENTARY DEPOSITS IN THE SKIN.—Besides darkening of the areola of the nipples before mentioned, there is occasionally a brown areolous blush round the umbilicus, which may extend along the median line to the pubes. It varies with the complexion of the patient. In rare instances the color covers the whole abdomen, and cases are recorded of its spreading over the entire body.

It is of little value for diagnostic purposes.

10. MENTAL AND EMOTIONAL PHENOMENA.—A marked change of temper in the female, as from amiability to peevishness, from cheerfulness to melancholy, etc., or exactly opposite changes, may occur. In some women the *moral* sense is depraved, or elevated; and *intellectual power* may be modified in degree.

These signs are only of corroborative use in diagnosis. They are generally more apparent to the household than to the physician.

ADDITIONAL SIGNS.—The following additional signs may be noted: Toothache or facial neuralgia, or actual caries of the teeth, during successive pregnancies; salivation without mercury; a tendency to syncope in women not disposed to faint when unimpregnated. Some women date impregnation, and often correctly, from unusual gratification during a particular act of coition.

The introduction of a clinical thermometer into the cervix uteri is said to indicate an elevation of temperature (1° or 2°) when pregnancy exists.

None of these indications are reliable.

SIGNS DURING EACH MONTH.—The principal signs recognizable during the different *lunar* months may assist the obstetrician in judging the duration of an existing pregnancy and probable date of delivery. They are as follows:

First Lunar Month.—Absent menses. Gastric and mammary signs may, rarely, begin thus early. Tip of cervix begins to soften by end of month. Slit of the os more circular. Uterus sinks. Umbilicus depressed.

Second Month.—Mammary and gastric signs *usually* begin. Uterus sinks; hypogastrium slightly flat; umbilicus depressed. Softening of cervix extending higher. Menses suppressed, as during remaining months.

Third Month.—Gastric symptoms continue; mammary signs increase. Womb still sunken; os low in vagina; navel still hollow: hypogastrium still flattened; progressive softening of os and cervix. At *end* of this month, womb begins to rise above brim of pelvis, with consequent higher position of cervix, and less flattening of abdomen and sinking of navel.

Fourth Month.—Gastric symptoms commonly subside. Breast signs further develop. Continued ascent of uterus, hence cervix higher in vagina, navel less hollow, abdomen less flat, or beginning to enlarge. Fundus uteri by end of this month is two inches above pubes. Progressive softening of cervix. Woman *may* "feel motion" toward end of the month, when skilled examiner may also detect ballottement and intermittent contractions. Uterine souffle audible by stethoscope. Very acute hearers claim to hear heart-sounds —very *un*usual.

Fifth Month.—Breast signs increase. The "secondary areola" appears. Quickening commonly occurs. Gastric symptoms entirely relieved. Ballottement easily recognized. Heart-sounds audible. Uterine murmur. Cervix softer, and *apparent* shortening begins. Fundus midway between pubes and navel. Abdomen visibly enlarged. Umbilical depression diminished.

Sixth Month.—Ballottement, heart-sounds, fœtal motions, and uterine souffle more distinct. Lower half of vaginal cervix softened. External os may just admit *tip* of finger by end of this month: this doubtful in primipara, though just possible. Breast signs and "secondary areola" increased. Umbilical depression almost effaced. Uterine tumor distinct. Fundus up to, or just above, navel. *Apparent* shortening of cervix increased.

Seventh Month.—Ballottement continues; other physical signs still more audible. Fundus two inches above umbilicus. Depression of navel well-nigh or quite effaced. Vaginal cervix *apparently* reduced one-half in length; lower two-thirds of it softened. Cervix still higher in vagina. Breast signs increased. External os may admit finger-*tip* even in primipara.

Eighth Month.—Ballottement doubtful; other physical signs more audible. Greater part of cervix soft, and "*apparent*" shortening increased. Abdomen distended, and distinctly pyriform in shape. Umbilical depression gone. Fundus midway between navel and ensiform cartilage. Os higher, and difficult to reach. Breast signs increased; milk *may* be secreted in some quantity in multiparæ. Umbilicus may begin to protrude toward last week.

Ninth Month.—Ballottement absent; other physical signs more distinct. Umbilicus protrudes beyond surface of abdomen. Fundus still higher than last month. External os will easily admit finger-tip; and in multiparæ os and cervix will admit finger to feel fœtal head and membranes. Lips of os thick and soft, and apparent shortening of cervix rapidly progresses.

Tenth Month.—Height of os and fundus and prominence of umbilicus reach their maximum about middle of month, and then begin to lessen. Cervix uteri obliterated by *real* shortening during thirty-ninth and fortieth week. Lips of os, in primiparæ, become thinner; in multiparæ, retain more thickness till the end. Presenting part low down. Os uteri easily reached. Physical signs distinct. Symptoms due to pressure disappear. There may be œdema of legs and genitals, with pain and difficulty in walking.

DIFFERENTIAL DIAGNOSIS OF PREGNANCY. *From Ovarian Tumors.*—In ovarian tumors (cystic degeneration of the ovary) the positive signs of pregnancy are absent; menstruation generally continues; there is fluctuation; history of tumor shows it to be of longer duration than pregnancy, and to have begun on *one side* of the abdomen; cervix uteri not softened; womb not enlarged, and can be moved without moving tumor; or, when tumor rolled to one side by abdominal palpation, cervix uteri does not participate in movement, as demonstrated *per vaginam*. Exceptions to be borne in mind, *e. g.*—

Pregnancy and ovarian tumor may coexist, when abdominal palpation will reveal *two* tumors, of different consistency, with a possible sulcus between them. Diagnosis difficult, especially when associated with dropsy of amnion (excess of liquor amnii). In the latter, fluctuation is more superficial; cervix uteri enlarged and softened; womb *does* move with movement of tumor. Before operating for ovarian tumor in any case of doubt as to existence of pregnancy, the womb may be measured by uterine sound, or the os dilated to admit examination by finger; or aspiration of fluid and its subsequent examination resorted to.

Amniotic fluid contains—	Ovarian fluid contains—
Epithelial cells.	Epithelial cells.
Oil globules.	Oil globules.
Albumen, but no paralbumen or metalbumen.	*Granular, non-nucleated ovarian cells, which become transparent, but not larger, by acetic acid.*
Meconium (?).	Paralbumen.[1]
Urinary salts (?).	Metalbumen.[1]
Sp. gr. 1.005–1.010.	Albumen.
Reaction alkaline.	Cholesterine.
Usually clear and limpid.	Sp. gr. 1.018–1.024.
	Is sticky and tenacious.

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[1] Dr. Thomas (*Diseases of Women*, fifth edition, 1880, p. 687) gives the following tests:

1. "*Test for Paralbumen.* Leave the fluid at rest in a cool place, filter or decant, and thus separate sediment from supernatant fluid. Pass a stream of carbonic acid gas through this fluid, and instantly a precipitate of fine flocculi of paralbumen will occur."

2. "*Test for Metalbumen.* Digest another portion of this fluid with absolute alcohol for three days Filter off the precipitate and heat with distilled water. Filter again, and metalbumen will be precipitated by sulphate of magnesia. Paralbumen is precipitated from this fluid by a few drops of dilute acetic acid, and redissolved by an excess."

[While paralbumen, as Dr. Thomas states, will be precipitated by carbonic acid gas, this is only a *property* of that substance, not a *test*. Liquor amnii contains an organic substance—a form of globulin—which is also precipitated by carbonic acid gas. A. F. A. K.]

From Fibroid Tumors of Uterus. (Fibrous tumors, Fibromata.)—In uterine fibroids, tumor is (comparatively) harder and more inelastic; it is unsymmetrical and nodular in outline; of much slower growth than pregnant womb; is accompanied with profuse menstruation; cervix not softened; but may be unevenly enlarged. Positive signs of pregnancy absent.

Rarely, fibroids may coexist with pregnancy. Diagnosis: by physical signs of pregnancy and results of time. Labor will come on, and may terminate naturally, provided tumor does not obstruct pelvis.

From Distention of Uterus due to Retained Menses.—In retention of menses there is history of pain at the menstrual periods; uterine tumor grows by sudden enlargement at each period with some decline in size afterward. Vaginal examination reveals mechanical obstruction, either in vagina or uterus, preventing egress of menses—this may be congenital, or acquired as result of inflammation, adhesion, etc. The breast signs and positive signs of pregnancy are absent.

From Obesity.—In enlargement of abdomen from fat, other parts of the body are enlarged; belly is soft and doughy to touch, and without any central (uterine) tumor. The positive signs of pregnancy and most of the signs about the breasts, etc., are absent. The cervix uteri remains small and unsoftened.

From Abdominal Dropsy. (Ascites.)—In dropsy there is distinct fluctuation and no uterine tumor. Resonance on percussion of abdomen changes its boundary line (horizontally), by changing position of female, owing to floating of intestines; cervix uteri unchanged; physical signs of pregnancy absent.

From Amenorrhœa associated with Congestive Enlargement of Cervix Uteri.—This is accompanied with symptoms of uterine inflammation; backache; pains in the hips, abdomen, etc.; weight in perineum: difficulty in walking; and, on examination, the cervix uteri is tender to the touch. Time will clear up doubt. If pregnancy exist, enlargement of the *body* of the womb will soon declare it.

From Pseudocyesis.—This means "false" or "spurious pregnancy." Women who *want* to be pregnant, and single women having reason to *fear* pregnancy, are apt to imagine themselves *enceinte* when they are not.

It occurs most often near the "change of life," when cessation of the menses, obesity, and various sympathetic phenomena appear to lend color to the false impression. There are hysteria, and involuntary projection and contraction of the abdominal walls, simulating the enlarged womb and fœtal movements.

Diagnosis: anæsthesia by ether at once disperses the abdominal signs, and vaginal examination reveals an unchanged cervix uteri and an empty, unenlarged womb.

From Tympanites.—Tympanitic distention of the abdomen gives tympanitic resonance on percussion. Physical signs of pregnancy absent. Uterus not enlarged. Tympanites and pregnancy may coexist. Exclude the latter by making *continuous* firm pressure upon the abdomen during several successive respirations, *increasing* the pressure during the expiratory acts, until the examining hands—one placed upon the other—feel the spinal column and thus demonstrate the absence of any intervening enlarged womb.

In examining the female for suspected pregnancy, the order of sequence in the several steps of the examination should be as follows:

1. Oral examination as to history, symptoms, and duration of case.
2. Examination of mammary glands.
3. Examination and auscultation of abdomen.
4. Vaginal examination.

CHAPTER VIII.

THE DISEASES OF PREGNANCY.

THE diseases incident to pregnancy are numerous and varied.

Let it be remembered that most of them are due either, 1st, to *sympathy*, other organs being disturbed in consequence of the tremendous changes going on in the reproductive system; or, 2d, to *pressure*—the mechanical pressure of the gravid uterus upon neighboring parts. Sympathetic disturbances predominate during the earlier months, mechanical disturbances during the later ones.

The opposite blood conditions of *anemia* and *plethora* also play an important *rôle* in determining the character and treatment of these diseases.

Again, generally speaking, the *nervous system is more susceptible to impressions during pregnancy* than at other times.

Finally, some of the pathological conditions to be studied are simply exaggerations of the physiological phenomena ordinarily numbered with the usual *signs* of pregnancy.

To anticipate the pathological phenomena of pregnancy without surprise, we have only to recall the physiological changes that must necessarily take place with every gestation. Processes of *change*—of structural evolution—whether progressive or retrogressive, and whether occurring in man, woman, or child, are *always* liable to be interrupted by slight disturbing causes, and thus develop *pathological* phenomena, of more or less gravity. The physiological changes incident to pregnancy are without a parallel, both in their degree, their number, and in the rapidity with which they occur. In a few months the uterus increases in *size* (from 3 to 12 inches in length; from 1½ to 9 in width); in *weight*, from about an ounce to about two pounds, *not* including its contents. The capacity of its cavity is enlarged 519 times (Lusk, after Krause). The area of its external surface is increased from 16 square inches to 339 square inches. *All* of its tissues: its muscles, ligaments, arteries, veins, lymphatics, nerves, and nerve-ganglia, become tremendously hypertrophied. Correlative changes in the abdominal walls, and in the position of the abdominal viscera, must also occur to accommodate the enlarged womb. The vagina and vulva undergo a somewhat similar hypertrophy, though less pronounced. Changes also take place in the folds of peritoneum and connective tissue in the pelvic cavity, as well as in the ligaments, cartilages, and joints of the pelvis itself. At the same time the mammary glands are quietly going through a hypertrophic evolution preparatory to lactation.

With these local phenomena, must necessarily take place an extensive modification in the general system of the female, especially with reference to the general nutrition. She provides the nutritive pabulum by which the growing organs are sustained, and by which the fœtus, with its appendages and bag of waters, is built up. She must therefore form more blood, digest more food, and increase the activity of her ex- and se-creting organs. The extra blood must be properly circulated, not only through the hypertrophied vessels of the enlarged reproductive organs, but also through the placenta; hence, in pregnancy, there occurs, normally, hypertrophy of the left ventricle of the heart, which disappears after delivery. The elimination of carbonic acid by respiration is increased. In short, the pregnant woman has to provide nutriment, to breathe, to circulate blood, to secrete and excrete, for *two* individuals—herself and her fœtus.

The suspension of ovulation and menstruation during pregnancy constitute further changes of function, which, while natural enough, must add something to the expenditure of vital force.

With these varied and numerous structural and functional changes, and with the necessary increase of work imposed on the general nutritive system of the pregnant woman, it is scarcely to be expected that gestation, especially in women whose lives and habits are artificial and unnatural in many respects—should be altogether *latent* and free from unpleasant symptoms, if indeed it be unaccompanied with serious disease. The wonder is rather the other way, viz.: that suffering is not greater and diseases more frequent and severe than we find them. It may well be said: to breed easily is a good test of bodily soundness.

CLASSIFICATION OF DISEASES.—No classification of the diseases of pregnancy yet devised is perfect: all are arbitrary. For convenience' sake we may group the several affections to be considered (confining the list to those *actually due to pregnancy*) as follows:

1. Diseases of the Digestive Organs:
   - *a.* Salivary glands.
   - *b.* Teeth.
   - *c.* Stomach.
   - *d.* Intestines.
2. Diseases of the Urinary Organs:
   - *a.* Kidneys.
   - *b.* Bladder.
3. Diseases of the Reproductive Organs:
   - *a.* Uterus.
   - *b.* Vagina.
   - *c.* Vulva.
   - *d.* Mammæ.
4. Diseases of the Circulatory Organs:
   - *a.* Heart.
   - *b.* Veins.
   - *c.* Blood changes.
5. Diseases of the Respiratory Organs.
6. Diseases of the Nervous System.

Salivation of Pregnancy. *Symptoms.*—A constant dribbling of saliva, day and night, but no sore gums, loose teeth, or offensive breath, as in mercurial salivation. Occurs usually during the early months, but may continue during the whole of pregnancy. It varies greatly in duration as well as in degree.

Prognosis is doubtful as to *cure* before delivery, but no serious consequences need be apprehended further than anxiety and annoyance.

Cause.—It is one of the *sympathetic* affections. The sympathy between the salivary glands and generative system is well known from the phenomena of mumps, coition, etc.

Treatment.—By gentle saline laxatives, which divert the excessive secretion to the intestinal glands, and by astringent mouth washes of tannin, alum, sulphate of zinc, or chlorate of potassa. Counter-irritation by tincture of iodine or small blisters externally, over the parotids. Extract of belladonna (gr. $\frac{1}{4}$, three times a day), or equivalent doses of atropia, may lessen the discharge. Pilocarpin (gr. $\frac{1}{12}$), and fluid extract of viburnum, have been recommended. The following gargle may be used two or three times a day:

℞. Sodii boracis glycerini, f℥ ij;
Aquæ rosæ, vel Aquæ, f℥ vj. M.

No treatment is reliable.

Dental Caries and Toothache.—That pregnancy actually causes the teeth to decay is a widespread belief among physicians as well as laymen: hence the proverb, "for every child a tooth." It has been ascribed to acidity of the oral secretion from dyspepsia, but quite as likely it is due to malnutrition of the teeth from certain constituents of their composition having been appropriated to nutrition of the embryo.

Treatment.—In recommending operative procedures upon carious teeth during pregnancy, the degree of "nervousness" or emotional susceptibility of the patient, and the severity of the required operation, should enable the physician to judge whether the mental shock or physical suffering to be incurred would be likely to bring on abortion. Conclusion accordingly.

In case no operative procedure is agreed to, a dose of morphia may be administered hypodermically for *immediate* relief of the pain, to be followed by anodynes, and *quinine in full doses*, thus:

℞. Quiniæ sulph. gr. xxx;
Morph. sulph. gr. ss;
Extr. belladonnæ, gr. iss;
Acid. sulph. *aromat.* q. s. ft. pil. vj.
Sig.—Take one every four hours.

Other remedies are: Fld. ext. gelsemium, gtt. iij–v, three times a day, until slight ptosis occurs. Croton-chloral, gr. ij–v, every hour, until not more than fifteen grains are taken.

Externally, warm applications and anodyne liniments (of camphor, aconite, laudanum, chloroform, etc.) may afford relief. Neuralgia of the face (*tic douloureux*) requires the same remedies. Faceache, headache, intercostal neuralgia, and other forms of the same disease, when caused by *anemia*, require *iron*, to which arsenic may be profitably added, as in the following formula from Lusk:

℞. Pulvis ferri, gr. ij;
Arsenic. gr. $\frac{1}{30}$.

To be taken in pill, three times a day, and continued several weeks; or, the

Ferri et quinæ citras, gr. v;
Aquæ, ʒj,

three times daily at meal hours.

Derangements of the Stomach; Excessive Vomiting.

Symptoms.—Exaggeration of ordinary "morning sickness." Vomiting increased in severity, duration, and frequency. May come on at all times, day and night. Ejected matters contain, successively, food, clear mucus, and regurgitated bile. May be severe pain in stomach from continued retching; Apt to continue weeks or even months in spite of treatment, then follow: *constitutional symptoms*, fever, emaciation, restlessness, exhaustion, and later, fetid breath; dry, brown tongue; feeble and frequent pulse; night sweats and insomnia. Still later, in the worst cases, vomiting stops (from exhaustion of reflex power of spinal cord), and nervous symptoms appear, viz., delirium, stupor, coma, and rarely, *very* rarely, death.

Prognosis.—Cases apparently hopeless sometimes "turn a corner," as it were, and end in recovery when it is least expected. The symptoms may stop from sudden mental emotion, or the occurrence of spontaneous abortion; or, again, a new medicine, or some special article of food or drink may succeed, after many others have failed.

Treatment.—The remedies are "legion." When some fail others must be tried. What will cure one case may be futile in another.

Diet.—Total abstinence from food or drink may be tried for a whole day, or even two or more complete days—a mode of treatment easy of application *early*, not so *later*, when the patient is exhausted.

Liquid diet, in small quantities frequently repeated, in preference to solids, the order of selection as follows:

- Milk.
- Iced milk.
- Meat soups; either
    - Beef, } carefully freed from grease.
    - Chicken, } carefully freed from grease.
    - Mutton, } carefully freed from grease.
- Well-cooked farinaceous liquids.
    - Barley-water.
    - Arrowroot.
    - Rice-water.
    - Corn-starch, etc.

Should these fail, and the patient avow a *desire* for bacon and cabbage, pork and beans, onions, green apples, horse-radish, mustard, or any other *apparently* unsuitable article, give it to her as an experiment, and put the slops aside.

Eating ordinary "pop-corn" will sometimes stop it.

Ice-cream, cracked ice, ice-water, and water-ices may do good service.

Wake the patient at midnight, or in the early morning hours, and give her (previously prepared) toast and coffee, or an egg, then quickly put out the lights and leave her alone to sleep again. Food thus given may be retained when it would be rejected at other times.

Scraped beef, *lean* and *raw*, spread on *very* thin bread, is worthy of trial.

Medicinal Remedies.—Of the various medicines used it is impossible to say which will suit any one case. For convenience of recollection they may be arranged into groups, as follows:

1. *Purgatives*—A brisk cathartic pill, or laxative enemata, until bowels are freely open (especially if there has been previous constipation), will "work wonders" in relieving emesis.

2. *Reflex Sedatives and Anodynes.*

℞. Potass. bromid. gr. x–xx, in some aromatic water, three times a day.

℞. Chloral. hydrat. gr. v (a small dose), given in solution, every two hours.

℞. Pulv. opii, gr. j, given in a single pill with as little fluid as possible. Not to be repeated.

Should the stomach reject all these,

℞. Potass. bromid. ʒj, or
℞. Chloral. hydrat. gr. xx, or
℞. Tinct. opii, fʒss,

may be administered in a nutritive vehicle *per anum.*

Morphia given either hypodermically or endermically (sprinkled on a blistered surface).

Anodyne plasters and liniments applied over the epigastrium; also counter-irritants, *e. g.*, mustard, cantharidal collodion, or blisters of Spanish fly.

3. *Alkalies.*—Especially suited to cases of acid stomach, heartburn, etc. Give aq. calcis ℥ss with ℥ss of milk and repeat every fifteen minutes; or Vichy water; or magnesia with milk; or the aromatic spirits of ammonia (dose xx drops) in ℥j of some aromatic water.

4. *Acids.*—Lemon-juice, orange-juice, or the acid. sulphuric. aromatic. (dose x–xx drops) in ℥j of water. Citric acid (*syrup. acidi citrici*, U. S. P.) f℥ss. Carbonic acid (gas), as in soda water, or the effervescing draught of the U. S. P., etc. One or two drops of the *dilute* hydrocyanic acid may be added to the latter.

5. *Aromatic Bitter Tonics.*—Tinct. cardamom. co., or tinct. gentian. co., or tinct. cinchon. co., or tinct. rhei dulc. (dose of each about ʒj), or the infusion of calumba with aromatic sulphuric acid.

6. *Intoxicating Drinks.*—Champagne *ad libitum.* French brandy, sherry, whiskey, *kirschwasser.* Either may be tried in

sufficient quantities to produce slight intoxication. To be resorted to only after a trial of less objectionable methods of treatment.

7. *Unclassified Remedies.*—Given empirically:

Bismuth subnitrate, dose grs. x–xx.
Salicine, grs. v–x.
Potass. iodid. gr. v.
Oxalate of cerium, grs. v to x.
Vinum ipecac. gt. j every hour.
Creasote, gtt. ij, in aq. calcis ℥ss.
Phosphate of lime, gr. xv–xx, in water, three times a day.
Tinct. iodinii *comp.* gtt. x–xv, diluted.
Fowler's solution of arsenic, gt. j three times a day.
Tinct. aconit. gtt. ij–iij.
Tinct. nucis vom. gtt. x, or
Strychnia gr. $\frac{1}{40}$, every two hours, in solution.

Still other, non-medicinal remedies may be necessary, as the restoration of a displaced uterus; a small venesection for relief of plethora; dilatation of the external os uteri with the finger has sometimes produced immediate relief; or the application of Chapman's ice-bag to the cervical vertebræ for ten or fifteen minutes, three times a day; or painting the os and cervix uteri (using Sims's speculum) with tinct. iodin., or argent. nitrat. (gr. xx, to water ℥j). The (at best, unphysiological) practice of coition during pregnancy, is probably one of the causes of this vomiting, and should be interdicted.

Should all means of relief fail and constitutional symptoms of a grave character arise, the last resort may be adopted, viz., the induction of abortion or premature labor; but the cases requiring it are *very rare,* and it is not to be employed without a consultation of two or more physicians.

The best means of inducing abortion in these cases is by dilating the cervix uteri with tents, but as moderate dilatation with the finger, as just stated, will often stop the vomiting, this should *first* be done, when, if the vomiting cease, further dilatation to produce abortion will be unnecessary. This mode of arresting vomiting was discovered accidentally by Dr. Copeman. The method bears his name.

Derangement of the Intestine.—Constipation is very common. Less often diarrhœa occurs. *Constipation* is a sympathetic affection during the early months, and due to pressure of the enlarged womb during the later ones.

Treatment.—During the early months *mild* saline laxatives, taken largely diluted before breakfast. After their action instruct the patient to visit the closet *daily* at a regular hour, and use gentle *massage* of the abdomen while there. Oatmeal porridge, and brown bread, bran bread, or corn-meal bread. Cool water to be drank every morning before breakfast, and again the last thing at night. Grocer's figs, dates, prunes, or tamarinds at night before drinking the water.

During the later months when masses of scybala are liable to accumulate, castor oil with tinct. opii may be given, and injections (daily if required, at a regular hour) of soap and water.

Should stronger medicines be necessary, either early or late, manna may be given, or extract of colocynth with extract of belladonna, or an occasional blue pill with soap and assafœtida; or a teaspoonful of compound liquorice powder at night; or ℞. Ext. colocynth. co., gr. ij, pulv. rhei, gr. j, extr. belladonnæ, gr. ¼, extr. hyosciami, gr. ss, in pill, at bedtime.

Impacted fecal masses sometimes require removal by mechanical means, and solvent enemata.

Diarrhœa.—If it have been preceded by constipation, and the evacuations contain but little fecal matter, and consist chiefly of mucus, give a gentle laxative of castor oil and laudanum, or a dose of solution of citrate of magnesia to cleanse the bowel.

After being sure that no accumulation in the bowel remains, and in cases where none originally existed, give vegetable astringents with opiates, *ex. gr.*, the tinctures of kino, catechu, or krameria (dose of either ʒj), with tinct. opii gtt. x, in ℥ss of mist. creta, three times a day. Or pills containing acetate of lead, opium, and ipecac may be prescribed, or syrup of rhubarb with bicarbonate of soda.

In addition enjoin muscular rest and the recumbent posture; mustard, followed by warm cataplasms to the abdomen, and milk diet with well-cooked rice-flour, arrowroot, or corn-starch, etc.

The occurrence of diarrhœa during pregnancy must not be neglected. Unless checked, it may lead to abortion or premature delivery. It should be treated with great care, especially if accompanied with tenesmus or other signs of entertitis.

DISEASES OF THE KIDNEY AND BLADDER. ALBUMINURIA.—Albumen occurs, varying in quantity, in the urine of about twenty per cent. of pregnant women.

It may exist when slight in degree, and especially if only during the later months, without any marked ill health or without being suspected unless the urine be tested; but in other cases where the quantity of albumen is great, and begins to appear early in the pregnancy, the prognosis may be of the gravest character.

Causes.—Pathologists are not fully agreed upon its etiology. One of the factors in its production is undoubtedly pressure of the gravid womb impeding the return of blood from the kidneys through the renal veins; hence its greater frequency of occurrence in primiparæ whose unrelaxed abdominal walls tend to keep the womb more firmly pressed upon those vessels. Congestion of the kidneys produced by exposure to cold and sudden suppression of perspiration during pregnancy may be the beginning of it, especially if the patient have previously suffered from renal disease. It is supposed to occur from an excess of albumen in the blood of the pregnant female, but this is not a settled point. Bright's disease of the kidneys is one of the dangers to be feared; it may or may not occur. Pressure of the gravid womb upon the ureters is sometimes the cause; the ureters and pelves of the kidneys, in these cases, are found, on *post-mortem* examination, to be dilated by accumulated urine. A sympathetic derangement of the renal circulation, sufficient to produce albuminuria, is probably brought about by prolonged sexual excitement during pregnancy, there being an intimate connection between the nervous ganglia of the kidney and the nerve filaments of the uterus. Albuminuria may also occur, *without* renal disease, from catarrh of the bladder, and, possibly, from abundant mucous discharge from the urethra, vulva, and vagina.

Diagnosis.—Albumen is detected by *boiling* the urine, which coagulates the albumen, as does also *nitric acid;* but heat will give a precipitate resembling that of albumen if phosphates are present; this, however, is immediately redissolved by nitric acid. The presence of albumen is inconstant; it may be absent to-day, but appear to-morrow, or *vice versâ*, hence, the examination should be repeated.

In cases due to congestion or inflammation of the kidney, microscopic examination reveals *tube-casts*, blood corpuscles, and renal epithelium.

Should albumen appear early in pregnancy, and in sufficient quantity to constitute a serious case, the following symptoms may be successively anticipated:

Anasarca, beginning usually in the lower limbs, but if the kidneys are seriously implicated dropsical puffiness of the face and hands may occur *first;* it may extend over the entire body and also to the serous cavities.

The urine becomes *high-colored* (dark, or smoky-brown, from admixture with blood), diminished in *quantity*, or it may be partially, or suddenly and completely *suppressed*. What little is obtained is composed largely of albumen and shows lots of tube casts and blood corpuscles, etc., under the microscope.

Nervous symptoms. The kidneys failing in their function, urea begins to accumulate in the blood and poison the nerve centres; hence occur headache, vertigo, nausea, and vomiting; derangement of special senses—impaired sight, hearing, etc.; the breath and perspiration may have an ammoniacal, urinous odor. Unless relieved, these symptoms terminate in

Uræmic convulsions (so-called "eclampsia," spasms); followed by stupor, going on to complete coma, perhaps death. (For phenomena of eclampsia see Chapter XXXII.)

Premature delivery may occur, or if the case reach full term convulsions may be looked for during labor.

After delivery the convulsions may cease and the patient recover; or, after partial recovery, the woman may die later from chronic Bright's disease; or remain more or less disabled from paralysis or mental derangement.

Prognosis.—Conditions rendering labor difficult; the abundant occurrence of tube-casts and extensive dropsy, especially of the face and hands *early* in pregnancy; together with indications of uremia—all augur unfavorably.

The *late* appearance of symptoms, dropsy confined to the lower extremities, uremic symptoms not impending, and the probabilities of an easy labor augur less danger, especially if the albumen is small in quantity and tube-casts are wanting, or few in number, and the urine is not suppressed.

Treatment.—Purgatives to produce watery stools and thus promote excretion from the bowels to relieve the disabled kidneys. Give pulv. jalap. co. ʒss (the compound contains two-thirds cream of tartar (potass. bitartrate), and one-third powdered jalap). Repeat, if necessary, and keep up a free action of the bowels with salines given daily, especially potass. bitart. ʒss–℥j a day.

Lessen congestion of the kidneys and promote their secretion by extensive dry cupping with tumbler glasses, or large cups, over the loins, followed by the application of sinapisms to the same part, and then hot poultices constantly applied.

Diuretics: Preferably potass. bitart. with infusion of digitalis, or the acetate of potass. with colchicum.

Promote the secretion from the skin by the warm water or vapor bath, or the hot wet pack, and diaphoretic drinks or medicines, as spts. mindererus, or jaborandi.

Beware of indigestible or solid food. A milk diet is best of any.

The treatment must be modified according as the patient is anemic or plethoric. If anemic give iron—the tinct. fer. chlo. with tr. digitalis—or the tartrate of iron and potassa with cream of tartar in solution. If plethoric, wet cupping over kidneys or bloodletting by venesection carefully, and abstemious diet.

Under the supposition that retained urea breaks up into carbonate of ammonia, benzoic acid has been given with a view to produce an innocuous benzoate of ammonia. It is of doubtful efficacy. Dose, five to ten grains, three or four times a day, in solution.

Should the symptoms grow worse in spite of treatment, and involvement of the nervous centres be indicated by disordered senses, convulsions, etc., *premature delivery*, if it do not take place spontaneously (which is not unusual), may be induced by catheterism of the uterus, tent, and dilators. (See Chapter XII.)

Convulsions occurring during labor—whether the latter be premature or otherwise—and whether spontaneous or induced, call for speedy delivery and the administration of chloral, morphia, bromide of potassium, anæsthetics, etc., as set down in Chapter XXXII. Forceps or version may be required.

DIABETES. (MELLITURIA. GLYCOSURIA.)—Sugar may be found in the urine of pregnant women, without any symptoms of ill health, and disappear after delivery, or after lactation. This so-called "physiological glycosuria" is of frequent occurrence. Again, women who are already the subject of diabetes may become pregnant, and the pregnancy go on to term without any necessary apparent interference.

But diabetes complicating pregnancy may be serious, or even fatal, to both mother and child. These cases are very rare, especially so in primiparæ. The child sometimes dies before birth, (during the latter months of pregnancy) or. soon afterward. The maternal deaths, thus far noted, have occurred after delivery, or premature labor.

Diagnosis.—Detect sugar by chemical tests (Trommer's, Fehling's, Moore's, etc.). The womb may be over-large from dropsy of the amnion, or from the child being enormous in size, owing to dropsical infiltration. Liability to abortion or premature delivery. Pruritus of the vulva is apt to occur.

Treatment.—The dietetic and medicinal means employed for diabetes without pregnancy. Should these fail, the question of inducing premature labor must be considered as a last resort.

BLADDER.—Irritability of the organ is indicated by frequent desire to micturate. It occurs as a sympathetic affection during the *early* months, causing distress and sometimes disturbing rest at night.

Treatment.—Bland mucilaginous drinks (flaxseed tea, etc.), infusions of buchu, uva ursi, or triticum repens, combined (if the urine is over-acid) with potass. bicarb. or liq. potassæ. Balsam of copaiba and tinct. belladonna internally may be tried.

Anodynes, preferably in the form of rectal suppositories of morphia or atropia.

Irritation of the bladder may occur *later* from pressure of the gravid uterus. The symptom is exaggerated by uterine displacements, by cross positions of the fœtus, and by congenital hydrocephalus increasing the size of the child's head. There are frequent and painful acts of micturition. Inability fully to empty the bladder, or complete retention may occur.

Treatment.—Be sure, in the first place, that the bladder is completely emptied. If in doubt, use a male elastic catheter, and repeat it as often as may be necessary. Restore the womb, if displaced. The knee-elbow position may enable the patient to empty the bladder. If the child is crossways in the womb, correct the malposition by external manipulation. (See "External Version in Cross Presentations," Chap. XVII.) A wide bandage round the abdomen will sometimes afford relief by supporting the uterus, and pushing it back and away from the bladder. Be sure to keep the bowels free from fecal accumulation, so as to leave more room in the pelvis for the uterus and bladder.

INCONTINENCE OF URINE.—The urine dribbles away in elderly women who have had many children. Treatment: the abdominal belt, tinct. cantharidis, gtt. v in ℥j of flaxseed tea, three times daily. Frequent ablutions and simple ointments are required to prevent or relieve excoriations of the skin. Small and frequent discharges of urine are often associated with over-distention of the bladder and paralysis of its walls. When this is suspected, examine for bladder tumor above pubes and use catheter.

Involuntary discharges of urine during coughing, laughing, sneezing, etc., may be relieved by tr. fer. chlorid., tr. nux. vom., or tr. belladonnæ.

AFFECTIONS OF THE REPRODUCTIVE ORGANS. PROLAPSUS UTERI (FALLING OF THE WOMB) DURING PREGNANCY.—It usually rights itself when the womb rises during the third or fourth month, but failing in this, the condition may become serious from the growing uterus getting jammed between the bony walls of the pelvis and pressing upon the bladder and rectum, or leading to abortion.

Treatment.—Rest in the recumbent posture, with the hips elevated on pillows, pushing up the uterus by gentle manipulation, and, if imperatively necessary to keep it there, pessaries. Continue treatment until uterus gets large enough to remain above the pelvic brim. Should impaction occur and obstruct discharge of rectum or bladder, the induction of abortion may become a necessary resort to save the woman's life.

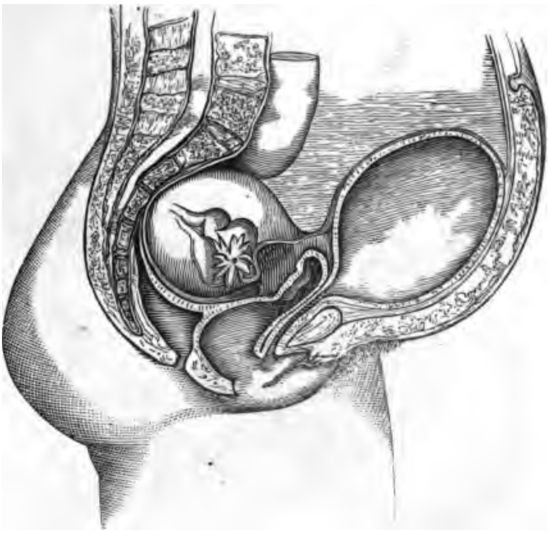
RETROVERSION OF UTERUS.—The fundus of the organ falls over backward, while the cervix is tilted upward and forward, toward or over the pubes.

Symptoms.—Pain in the back, numbness or pricking or unsteadiness in the lower limbs, and difficult or very painful defecation and micturition. The diagnosis is made on finding the fundal tumor in its malposition by a digital examination *per vaginam,* while the os and neck are tilted high up toward the pubes.

Prognosis.—Usually favorable from gradual spontaneous replacement as the womb increases in size, but serious or fatal consequences may arise from impaction of the growing organ (as in prolapsus) if it is not replaced during the earlier months.

Treatment must not be delayed. Empty the bladder by a male elastic catheter. If this is impossible, aspirate the bladder. Empty the rectum. Place the woman in the knee-elbow position, and restore the organ by gentle digital pressure either by vagina or rectum, or both conjointly.

FIG. 26.



Retroversion at about twelfth week.

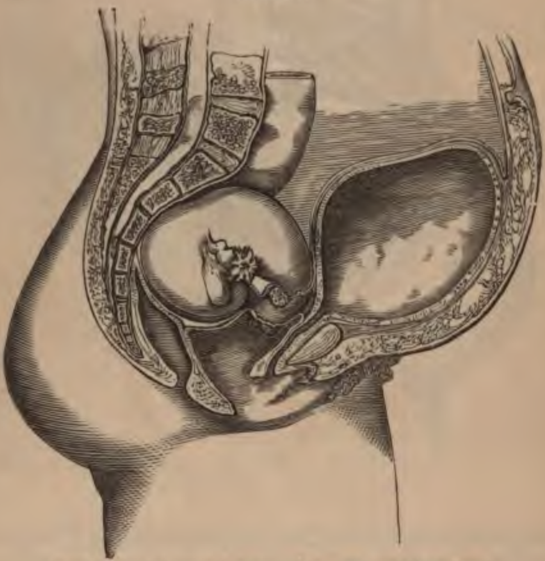
Should manipulation fail, make gentle prolonged pressure by distending a soft rubber bag in the vagina, or a Barnes's dilator in the rectum, the pressure thus induced being kept up for several hours. After replacement a Hodge pessary may be required to retain the womb in its normal position.

Should all means fail to get the fundus above the sacral promontory, abortion or premature delivery may be required to save the woman's life.

Fig. 26, page 113, from Leishman (after Schultze), shows retroversion of gravid womb at about twelfth week, with retention of urine and enormous distention of bladder, owing to the urethra being dragged up and compressed by the displaced cervix uteri.

Retroversion of the uterus is frequently associated with some degree of retro-*flexion*—a bending of the axis of the womb, in which the os externum and vaginal portion of the cervix appear to maintain their normal position, while the fundus is bent backward toward the sacrum (Fig. 27), but the disastrous results are the same as in simple retroversion: so is the treatment.

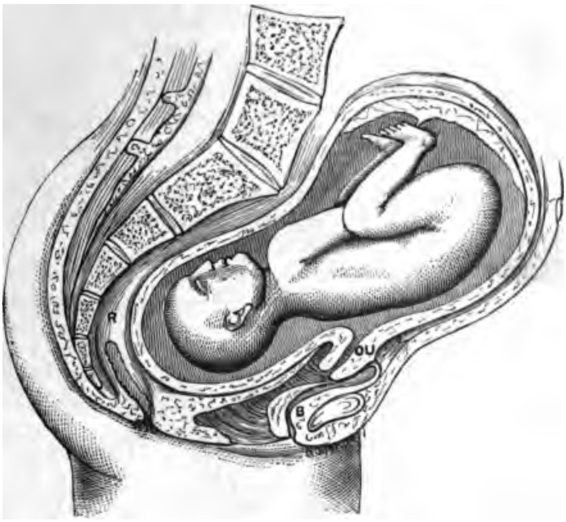
FIG. 27.



Retro-*flexion* of gravid uterus—sixteenth week (Schultze).

In the case of retroflexion it occasionally happens that the womb becomes dilated into a sort of double sac, one pouch of it being above, and the other below the pelvic brim, as shown in Fig. 28, from Dr. Barnes's work. Impaction, and dangerous pressure upon bladder, etc., in the pelvic cavity, are thus relieved. *Both* pouches may also rise above brim spontaneously as pregnancy proceeds, and the gestation reach full term; or, the lower pouch remaining in the pelvic cavity, full term may still be attained, but delivery is impossible owing to displacement of the os above pubis, and occupation of the pelvic cavity by the lower pouch, unless the latter be pushed up by manual pressure *per vaginam* and the os uteri brought down, which is the proper treatment, both during pregnancy and labor.

FIG. 28.



Bisacculated uterus—incomplete retroflexion.
R. Rectum. OU. Os uteri. B. Urethra and bladder.

ANTEVERSION OF UTERUS.—Since the anterior pelvic wall is only one-third as deep as the posterior one, there is far less difficulty in the fundus uteri getting above the brim when it is displaced anteriorly (anteversion) than when retroversion occurs. But when *above* the brim the womb may still remain anteverted and press upon the bladder, as occurs chiefly in deformed women (pelvic deformity), or in cases of ventral hernia, or in those whose abdominal walls have become relaxed and pendulous from frequent childbearing.

Treatment.—Rest on the back; abdominal support to the flabby belly by a wide bandage; and a catheter (male elastic always during pregnancy) if necessary to empty the bladder.

ANTEFLEXION of the womb—*bending* of the uterus so that the fundus and body are curved forward toward the bladder and pubes—may or may not be associated with anteversion, just described. It is apt to occur in women whose uteri were anteflexed before pregnancy began. *Rarely* the fundus *may* become locked behind the pubes, but it is far more easily replaced than retroflexion, the pubic bones offering no projecting promontory like that of the sacrum.

The *symptoms* are: irritable bladder, frequent micturition, increased by walking and sitting, mitigated by recumbency. Vomiting excessive and troublesome. Pain in the hypogastric region or pelvic cavity. Abortion may occur, if the organ do not right itself. Vaginal examination reveals the os uteri far back, and the fundus, as a hard tumor, felt through anterior vaginal wall.

Treatment.—Rest in bed on the back. Replace the womb by digital pressure per vaginam, or by elastic bag as for retroversion cases. A pessary may, rarely, be required to maintain the womb in its restored position.

LEUCORRHŒA, OR "WHITES."—It consists of an excessive discharge of mucus from the vaginal canal. It is liable to irritate the vulva and produce itching and excoriation. Condylomata may exist, or granular papillary projections constituting granular vaginitis. Generally the disease is simply a hypersecretion, due to congestion of the vaginal wall or cervix uteri.

Treatment.—Avoid the use of injections for fear of producing abortion. Frequent tepid emollient ablutions are indispensable for cleanliness, and to prevent excoriations, etc. Laxatives to correct constipation. If the discharge is sufficiently profuse to *require* moderating by astringents, use vaginal suppositories of tannin, alum, etc.

Pruritus Vulvæ.—Intense itching of the vulva is of frequent occurrence during pregnancy. There is an irresistible desire to rub the parts, sometimes even during sleep, which may lead to excoriation, scabbing, ulceration, etc. Itching may extend over thighs, abdomen, and other parts of the body.

Treatment.—Frequent tepid emollient ablutions. Dust the vulva afterward with starch powder four parts, to pulv. camphor one part; or powdered zinci oxid. Other remedies are: a solution of corrosive sublimate gr. ij, to water ℥j; solution of sodæ borat. ℥j, to water one pint; infusion of tobacco (ʒss, to water one pint); application of essence of peppermint with a camel-hair brush; sulpho-carbolate of zinc ℥j, to water one pint; carbolic acid gtt. x, with glycerine and water of each ℥ss; and dilute hydrocyanic acid ʒss, with acetate of lead ℈ij, to water one pint. Paint the parts with a four per cent. solution of hydrochlorate of cocaine. If ulcers exist, remove scabs by warm poultices, then apply nitrate of silver gr. xx, to water ℥j, to be followed by calomel ointment (ʒj of calomel to ℥j of lard or simple ointment).

Painful Mammary Glands.—Breasts are the seat of pain of a neuralgic character, due to rapid development. In plethoric women, relief may be obtained by the derivative effect of saline laxatives. In anemic, sensitive, nervous women, give iron, quinine, wine, and good food. In either case, application of belladonna ointment, or the tincture sprinkled on a bread poultice, or anodyne liniments of olive oil, camphor, and laudanum, will afford relief.

Diseases of the Blood and Circulatory Organs.—**Palpitation of the Heart** may occur either sympathetically during the early months, or later from encroachment of the enlarged uterus pushing up the diaphragm, and embarrassing the heart's action.

Treatment.—The sympathetic trouble is usually associated with nervous debility due to anemia, and therefore requires iron, quinine, good diet, including raw onions, and a little wine. A plaster of belladonna over the cardiac region. Direct relief may be obtained, temporarily, by assafœtida, hyoscyamus, and other antispasmodics.

The opposite state of plethora *may* exist, when rest, laxatives, low diet, and, perhaps, bloodletting will be required.

For the mechanical embarrassment of the later months, little can be done further than palliation by antispasmodics and attention to the general health and excretory functions, but the patient may be consoled with the assurance of relief when the womb sinks down prior to delivery. Temporary ease may be attained by belladonna plasters over the præcordium.

SYNCOPE, OR FAINTING.—The attacks may recur several times a day. The pulse is feeble, pupils dilated, consciousness partly lost, and there may be hysterical phenomena.

Treatment.—Recumbency with the head low, the application of ammonia to the nostrils, and diffusible stimulants, valerian, etc., during the attacks. In the intervals, iron, food, and bitter tonics. Bromide of potassium gr. xx three times a day.

ANEMIA.—The *exact* blood changes of pregnancy that occur *normally*, are still unsettled, but the tendency generally is toward *anemia*, which may become so pronounced as to require treatment. It is most apt to occur during the later months when the red corpuscles and albumen of the blood are diminished and its fibrin increased. A few *fatal* cases have been recorded. The *symptoms* are those common to anemia in other cases: pallor, loss of appetite, feeble and frequent pulse, weakness, and fatigue after slight exertion, nervousness, emotional excitability, palpitation, neuralgia, etc. In some cases there occur : vertigo, tinnitus aurium, flushed face, fulness or weight in the head, and somnolence, which might, without care, be mistaken for symptoms of plethora. In other instances the blood becomes so thin and *watery* as to constitute a veritable *hydræmia* when œdema and dropsy may occur, beginning in the feet and extending successively upward to the legs, thighs, vulva, vagina, and uterus. The labia may become enormous in size, the œdematous distention even leading to gangrene.

Treatment.—Iron ; the quantity of which in the blood, owing to loss of red blood-corpuscles, is diminished, as proved by analysis. Precede the administration of iron by laxatives, tepid baths, sunshine, pure air, and outdoor exercise, to prepare the system for its reception. Iron is often not well borne by pregnant women. Its solid preparations—the carbonate, the iron by hydrogen, or the ferrum redactum—are preferable. They may be combined with bitter tonics—the solid extracts of cinchona, gentian, etc., or with laxatives—rhubarb or aloes; and with quinine or arsenic, or nux vomica. Give a *meat* diet—lean, underdone beef, or scraped lean, *raw* beef; together with milk, or beef tea, eggs, and some red wine or bitter beer. In *hydræmic* cases, the œdematous labia may require small punctures to let out the fluid and relieve distention (always with antiseptic dressings) and recumbency, or elevation of the lower extremities.

PLETHORA.—Plethora during pregnancy is rare: it may, however, occur, or simply constitute the continuance or increase of a preëxisting plethora. The *symptoms* are opposite to those of anemia, except with regard to headache, giddiness, flushing of the face, and ringing in the ears, which may occur in both, but the general appearance of the female, together with, in plethora, the strength, fulness, and slowness of her pulse, will render diagnosis easy. Many plethoric women present a previous history of profuse menstruation. Uterine hemorrhage during gestation and consequently abortion or premature labor may occur, unless relief be afforded.

Treatment.—Saline laxatives to produce watery evacuations and thus lessen vascular tension; or a more decided cathartic to begin with. Avoid animal food—meats, eggs, milk, as also highly seasoned dishes, condiments, and stimulants. Restrict the *quantity* of food, and let it consist chiefly of vegetables, light soups, and cooling drinks. *Immediate* relief may be afforded by bleeding, even though the quantity of blood taken be quite moderate. Leeches or cupping will be preferable when, coupled with general plethora, there is local hyperæmia of some particular organ, as the brain, kidneys, or uterus. Sexual excitement and coitus must be prohibited.

VARICOSE VEINS, HEMORRHOIDS, THROMBUS, ETC.—Pressure of the uterus upon the large venous trunks causes distention and varicose dilatation of the venous branches below them. Hence œdema and varicose veins of the legs, hemorrhoids, dilatation and rupture of the veins of the vagina and vulva, with external bleeding, or formation of thrombi.

Treatment.—Rest in the recumbent position, support of the uterus by abdominal bandages, support of the veins of the legs by elastic stockings, or well-applied roller bandages. Rupture of a varicose vein may occasion fatal bleeding; hence supply the patient with compress and bandage and teach her how to use them in case of need.

Hemorrhoids require, in addition, laxatives to correct constipation, cool water enemas before stool, and the avoidance of all straining efforts. Cold ablutions to the anus followed by astringent ointment, *ex. gr.*,

℞. Ung. gallæ,
Ung. stramonii, āā ℥j. M.
Sig.—Apply to the anus, inserting some within the sphincter.

The confection of sulphur is a good laxative in these cases, and, contrary to former experience, aloes has been found beneficial, as in the following formula by Dr. Fordyce Barker:

℞. Pulv. aloes soc.,
Sapo cast. aa ℈j;
Ext. hyoscyami, ʒss;
Pulv. ipecac. gr. v. M.
Ft. pil. No. XX.
Sig.—Take one night and morning.

Thrombi of the vulva or vagina, if small, may be left to nature for absorption to take place. If large, causing pressure on surrounding parts and threatening rupture, the only treatment is free incision and careful removal of the contained clots, followed by antiseptic washing, cleanliness, rest, styptic applications if necessary to prevent the recurrence of future, or to stop existing hemorrhage. The prognosis in such cases is doubtful.

DISEASES OF RESPIRATORY ORGANS.—These comprise, chiefly, *functional disturbance of the respiratory acts*, manifested by two symptoms, viz., *cough* and *dyspnœa*. The acute and chronic *organic* diseases, pneumonia, pleurisy, etc., occurring *with*, but not *on account of* pregnancy, may be excluded from simple functional disturbances by the absence of their characteristic physical signs.

Cough and *dyspnœa* occur during the early months as nervous or sympathetic troubles, when they require anodyne and palliative remedies, counter-irritation by sinapisms, reflex sedatives (notably the bromides), and antispasmodics—valerian, camphor, morphia, dilute hydrocyanic acid, etc.—as in the following combination:

℞. Elix. ammon. valerianat. fʒij.
Spts. ætheris nitrosi, fʒij.
Liq. morph. sulph. f℥ss.
Acid. hydrocyanic. *dilut.* gtt. xij.
Aquæ camph. ad. f℥iij. M.
Sig.—Tablespoonful every four hours, until relieved.

During the later months, cough and dyspnœa result from the enlarged uterus encroaching upward upon the diaphragm, thus interfering with a deep inspiration, hence the breathing is shallow, frequent, and unsatisfying. This is *most* observable where the womb is *very* large, from twins, dropsy of the amnion, etc. *Treatment* by palliatives, as in the sympathetic cases, but with little assurance of success until the womb sinks down before delivery, when we may anticipate spontaneous relief. Laxatives mitigate the suffering.

NERVOUS DISEASES.—Exaggerations of the mental and emotional phenomena already referred to as signs of pregnancy may occur. They lead us to apprehend insanity. The time of their most frequent occurrence is from the third to the seventh month.

Treatment consists in the promotion of *sleep* by bromides and chloral hydrate; laxatives; moderate exercise, cheerful society, and change of scene; together with attention to diet, and the proper digestion and assimilation of food.

CHOREA during pregnancy occurs chiefly in those who have previously suffered from the disease. It is most frequent in primiparæ. It is a serious complication sometimes ending in insanity or premature labor, and, in about one-third of the cases, death. The child is often affected with the disease.

Treatment by arsenic, iron, quinine, the bromides, etc., as in other cases not associated with gestation. Induction of premature labor as last resort.

PARALYSIS (hemiplegia, paraplegia, facial palsy, or paralysis of the organs of special sense) occasionally occurs.

Determine by urinary analysis whether or not the symptoms are due to *uremia*. If they are, the question of inducing premature labor must be considered. There is no further treatment other than the usual remedies for paralysis unconnected with gestation.

CHAPTER IX.

ABORTION.

ABORTION is delivery of the fœtus *before it is viable—i. e.*, before the end of the twenty-eighth week. Between this time and full term, discharge of the ovum is called "*premature labor.*" No other division of the subject is necessary; though some writers limit the term "*abortion*" to discharge of the ovum during the first twelve weeks; if it occur between the twelfth and twenty-eighth week, they call it "*miscarriage.*" The symptoms, however, differ somewhat during the first three months from those of the succeeding four, as does also the treatment. Exceptionally the child is viable before the twenty-eighth week, even a month or two earlier. Such cases are rare.

FREQUENCY.—About one out of every twelve pregnancies ends in abortion, and ninety per cent. of childbearing women abort once or more during their lives.

CAUSES.—The *predisposing causes* may refer to either mother, father, or child.

Death of the child from any cause, either from disease of the placenta or membranes, or obstruction in the umbilical cord, or inherited syphilis, or the eruptive fevers. (It is known that the *fœtus* may be attacked with these last.)

On the part of the mother, constitutional syphilis is a potent cause. The occurrence of acute inflammation of the thoracic or abdominal viscera; the exanthematous fevers; plethora; anemia; albuminuria; *excessive* vomiting; constipation; placenta prævia; diseases and displacements of the uterus; multiple pregnancy; chronic lead-poisoning; chronic ergotism from eating bread made of spurred rye; the precocious, or very late occurrence of pregnancy; the abortion-habit.

On the part of the father, precocity, senility, syphilis, debauchery, and debility may lead to it.

Exciting Causes.—*Mechanical violence*, as blows, falls, violent exertion, the concussion of railroad accidents, excessive venery, sea-bathing, irritation of the mammæ, tooth-pulling, etc.; or *emotional* violence, as excessive fear, joy, grief, anxiety, anger, etc.

Many abortions no doubt occur from the wilful administration of drastic emmenagogue medicines, and from intentional disturbance of the ovum with instruments.

The above causes act, for the most part, in one of two ways, either by producing *death of the fœtus*, or by inducing *uterine contraction.*

The most decided *exciting* causes are often strangely inert, in the absence of any *predisposing* ones.

PERIOD OF OCCURRENCE.—It occurs most frequently during the second and third months, though, quite possibly, many abortions during the first month are never recognized.

SYMPTOMS.—*Pain*, intermittent in character and due to uterine contractions; and *hemorrhage*, due to partial separation of the ovum from the uterine wall.

Chilliness, nervousness, anorexia, *ennui*, flighty pains in the back and abdomen, frequent micturition, and a mucous or watery discharge, may occur and continue some days before "labor-pains" and bleeding, but they are not common until after the third month.

When the unbroken membranes with their contents are expelled entire (like a "soft-shelled egg"), and which is most likely to happen during the first three months, the hemorrhage may be only moderate; but when the sac bursts, and collapses after discharge of the fœtus and liquor amnii, bleeding is usually more profuse.

DIAGNOSIS.—Pain and bleeding having occurred, the diagnosis is rendered positive by vaginal examination revealing partial or complete dilatation of the os uteri, and presentation in it of the bag of waters, umbilical cord, or body of the fœtus. Examine *all* discharges, preferably under water, for traces of membranes, fœtus, and chorial villi, otherwise abortion may occur without recognition. Should doubt arise from discharges having been thrown away, unexamined, it may be stated as a *general rule* that if the womb have completely emptied itself, the symptoms will subside; if otherwise, they will continue, or recur, after a possible remission.

DIAGNOSIS OF ABORTION FROM RETURNING MENSTRUATION.—In menstruation bleeding generally relieves the pain; not so in abortion; menstruation occurs at the period; abortion not necessarily so. The digital examination clears up doubt. In abortion there may be a history of violence or some other cause for the symptoms.

PROGNOSIS.—Abortions often consume more time than full-term labors, owing to the long and narrow cervix uteri, and, as yet, imperfect development of the uterine muscles. The secundines are often retained hours or days after discharge of the fœtus. With proper treatment abortion is seldom fatal; it is less dangerous than full-term delivery, as regards the chances for life, but it is far more likely to leave chronic uterine disease, and great debility from hemorrhage.

THE TREATMENT OF ABORTION will differ much according as we design to prevent, or, on the other hand, hasten delivery.

If the hemorrhage is only slight in degree, and the pains feeble, if the os uteri is not much dilated, and the membranes are not broken, we strive to continue the pregnancy; if opposite conditions prevail, we cannot do so, but must hasten delivery to put the woman in safety.

Should the fœtus be dead, the uterus must of course be emptied. The *signs of fœtal death* are: languor, low spirits, pallor, chilliness, perhaps some fever, sunken eyes surrounded by darkened rim, nausea, anorexia, fetid breath, and bad taste in the mouth; a feeling of weight and coldness in the hypogastrium; flabbiness, with stationary or diminished size of abdomen, with loss of its normal firmness and elasticity; the uterus rolling more easily from side to side; flaccidity and diminished size of breasts. These symptoms may not come on until *some time after* fœtal death. They may also be produced by other causes. The concurrence of several is necessary for diagnosis, which last, even then, may not be positive. Fetid discharges *per vaginam*, with or without exfoliated epidermis, are more reliable. When pregnancy has sufficiently advanced, the absence or cessation of previously recognized heart-sounds and fœtal movements is important. (For signs of fœtal death during labor at or near full term, see Chapter XXI.)

Treatment to Prevent a Threatened Abortion when the Symptoms are Slight.—Absolute rest in the recumbent posture, in a cool room with light bed-clothing. Mental and emotional quiet. Cooling drinks, avoidance of all stimulants. *Opium* (preferably the liq. opii sedativus, gtt. xx–xxx) to arrest uterine contraction and check hemorrhage. *Astringents*—lead, alum, the mineral acids, may be added if the bleeding continue. Never use ergot or the tampon; and the application of cold cloths to prevent hemorrhage is of doubtful utility; it rather augments uterine contraction. The *Viburnum prunifolium* (fld. ext. ʒj, or solid ext. gr. iv, in pill, every two or three hours) is alleged to be a valuable preventive of abortion: it quiets uterine contraction. Evidence in favor of its utility is increasing.

Remove any known cause of the symptoms; and restore, by posture and gentle manipulation, any existing uterine displacement, especially retroversion or retroflexion.

Efforts to prevent abortion must, of course, cease after the *fœtus is dead*, but of this last event there is, during the first three months, no unequivocal sign. Reduction in the size of the uterus, or its smallness when compared with the known duration of the pregnancy, is perhaps of most diagnostic value in this respect.

Treatment when the Abortion is Inevitable.—In the majority of cases the delivery may be left to complete itself by the natural powers, *unless the hemorrhage is excessive*, when our main and sure reliance is upon the *tampon*, which (1) stops hemorrhage, (2) stimulates uterine contraction, and (3) promotes complete separation of the ovum from the uterus by causing blood to accumulate between the womb and fœtal membranes. The tampon is a vaginal plug, consisting of almost any soft, pliable fabric: a silk handkerchief, a soft towel, pledgets of cotton cloth, disks of antiseptic cotton, etc. Whatever is used must be first carbolized and smeared with oil or glycerine to facilitate its introduction (preferably through a speculum). Sponges, from their meshes containing air, and for other reasons, are not desirable. To facilitate easy withdrawal of the tampon, its several pieces may be connected by a continuous string (like the bits of paper on a kite tail), or an unwound roller bandage may be used. The vagina must be *completely* and *compactly* filled: the packing to begin round the cervix uteri and be continued to the vulva. To prevent the vagina expelling the plug, place a "T" bandage over the vulva. The bladder should have been previously emptied, for the tampon may interfere with micturition. A prepared sponge tent placed in the cervix uteri may precede the tampon and assist dilatation, if necessary. The plug must not remain in the vagina longer than twelve hours—better not more than six or eight. If the woman be very weak from hemorrhage, a second one should be in readiness before the old plug is removed. The bladder must again be emptied by the catheter if required, and the vagina cleansed with carbolized water. It is not always necessary to repeat the tampon. The ovum may be found in the vagina (when the plug is removed), from whence it may be easily extracted, and if entire, with cessation of bleeding. Nothing further will be needed than ablution of the parts. Should the hemorrhage continue, and the ovum still remain *in utero*, repeat the tampon, and give ergot (fld. ext. ʒss–j every three hours), and apply cold to vulva and hypogastrium. We may be able to expedite delivery by careful manipulation, when the os is dilated and the ovum protruding through it, but if the membranes are still intact we had better abstain from this effort, lest we rupture them.

It is very common after the third month, less so before then, for the fœtus to be expelled, leaving the membranes (and placenta, if it be developed) *in utero*. When this occurs during the first three months, the cord may be cut or broken (no ligature is necessary), the fœtus removed, and the case treated by ergot, cold, and the tampon, as before described. During and after the fourth month the tampon is not advisable, for the uterine cavity is then large enough to contain considerable blood, and the uterus is also sufficiently large to be subjected to compression and grasping of its wall with the hand through the abdomen, by which discharge of its contents, contraction, and arrest of hemorrhage may be effected, or *two or three* fingers may be passed into the uterus (the cervix being sufficiently open) and the placenta detached and withdrawn.

So long as any part of the secundines is retained, even though the bleeding temporarily cease, and whether it be before or after the third month, there is always risk of the blood-flow recurring, as well as of septicemia (from decomposition of the retained matters), pelvic peritonitis, and cellulitis. Hence it is safer in any case to secure delivery of the secundines without delay. In cases where the placenta is not adherent, but simply lodged in the cervix, the action of an emetic (ipecac), or of a brisk cathartic, especially if the female be not too feeble to sit during the operation of the latter, may suffice to dislodge it. Should these and other means already mentioned not answer the purpose, a finger or blunt curette may be passed to the fundus (provided the os be sufficiently patulous, and if not it should be dilated with tents), by which the entire retained contents may be effectually and completely removed.

During this delay the vagina must be freely washed out with a solution of carbolic acid (ʒij to water Oj) three times a day, to prevent absorption of septic matter through its mucous surface, and after the operation, whether symptoms of septicemia have or have not occurred, the same solution should be injected *into the uterus, special care being taken to secure its immediate return*, by noting that the os is sufficiently open for this purpose. *Hot* water and *ice* water, carbolized, have of late been highly recommended as intrauterine injections in these cases, alike for their styptic as for their antiseptic influence (Mundé).

The after-treatment of abortion must be continued rest, as after a full-term labor.

In women who have aborted once or more, and who are likely to establish in this way the "abortion-habit," we should enjoin abstinence from coitus for a year or more; removal of all suspected causes of the accident; when pregnancy again occurs, insist on perfect rest *in bed* for a week or ten days, at times corresponding to the menstrual epochs. After conception, *coitus* must be forbidden during gestation.

Imperfect Abortion.—When remnants of the ovum remain *in utero*, as they may do for days, weeks, or even months, after a supposed complete emptying of the womb, it is termed "imperfect," or "incomplete" abortion.

All symptoms may subside, wholly or in part, but sooner or later hemorrhage will recur, with discharge of decidual or placental débris, which may or may not be putrescent—in the former case endangering septicemia, etc. Such cases result from, and also lead to, endometritis. Retained blood may deposit successive layers of fibrine upon fragments of membrane or placenta, constituting so-called "fibrinous polypus." Renewal of pains and bleeding ultimately result.

Treatment consists in completely emptying the uterus; with use of antiseptic injections.

Missed Abortion.—As, at full term, the child may die and remain *in utero* weeks or months afterward, constituting so-called "missed labor," so, during earlier months of pregnancy, death of the fœtus may occur and the ovum still remain weeks or months in the uterine cavity; this is "*missed abortion.*"

In these cases the symptoms of pregnancy are arrested; milk may appear in the breasts; the liquor amnii is absorbed; the child macerates or becomes "mummified"—rolled up in the placenta or membranes like a parcel—but usually it is *not* putrid, for the unbroken membranes have protected it from atmospheric germs.

Pains, bleeding, and unexpected discharge of the mass usually result. When this last does not occur in *suspected* cases (*positive* diagnosis is difficult), catheterism of the uterus, or dilatation of its cervix by tents, to provoke contraction and expulsion of the ovum, is the proper treatment.

CHAPTER X.

EXTRAUTERINE PREGNANCY, ETC.

Extrauterine Gestation (Extrauterine Fœtation).—Development of the ovum outside the uterine cavity.

Varieties.—The ovum may lodge in the Fallopian tube (tubal pregnancy); or it may drop into the cavity of the peritoneum (abdominal pregnancy); or it may stay in the ovary after the Graafian vesicle has ruptured (ovarian pregnancy); or it may develop in the substance of the uterine wall (interstitial pregnancy). There are a number of other rare subvarieties.

Tubal pregnancy is the most common variety, but all forms of extrauterine fœtation are rare.

Causes.—Spasm, paralysis, stricture, doubling of or pressure upon the tube, etc., causing obstruction of its canal. It is rare before thirty years of age.

Prognosis.—All forms of extrauterine pregnancy are extremely dangerous; the tubal variety most fatal of all.

Diagnosis.—As the cases usually terminate (a few exceptions have been recently reported) by rupture of the tube and death before the end of the fourth month, the condition is often unsuspected before symptoms of approaching rupture begin.

The early rational signs of pregnancy exist, but the physical or positive signs are absent.

On examination, a tumor may be felt on *one side*, usually in the iliac region. There may be slight pain occasionally in the same. The womb is slightly enlarged; but nothing actually wrong may be suspected till premonitory symptoms of approaching rupture begin. They are: severe colicky pains referred to the tumor, and the appearance of a bloody, shreddy discharge from the uterus.

Symptoms of Rupture.—Severe and sudden abdominal pain, with intense collapse, from internal hemorrhage. Swelling and doughiness of the abdomen from accumulating clotted blood. The *results* are: death from collapse; or, surviving longer, death from peritonitis: or, recovering from this, the cyst, now formed of organized lymph, inflames and suppurates, the abscess discharging externally, or into some neighboring cavity, together with fragments of the fœtus. Death from septicemia or exhaustion may result. Finally, the re-encysted ovum may remain, without any inflammation, become partially absorbed, leaving a calcareous, inorganic remnant (lithopædion) which may give no further trouble during a long life.

Treatment before Rupture of the Tube.—Kill the ovum to stop its further growth, by (1) aspiration of the liquor amnii; or (2) by injecting morphia into the amniotic sac or body of the fœtus; or (3) by electric shocks conveyed through it—one pole of a battery being passed into the rectum till in apposition with the tumor, the other on the abdomen.

Treatment after Rupture.—Rest; compression of abdominal aorta; application of ice over abdomen to lessen bleeding; and opium to relieve pain and insure absolute rest. Under this treatment there is a bare chance the hemorrhage may stop and the fœtus become re-encysted by a wall of organized inflammatory exudation, and so remain harmless,[1] or be discharged later by abscess and bursting of the cyst, either externally or into some neighboring viscus. The only other alternative is laparotomy—opening the abdominal cavity by incision and removing entire cyst and tube, after ligating its pedicle, as in ovariotomy. The fœtus is taken out and all effused blood sponged from the abdominal cavity. The operation to be performed under Listerism.

Removal of the cyst, fœtus, etc., through an incision made by cautery knife in the top of the vagina has been suggested. Uncertainty of diagnosis, and the dislike to operate upon women almost at the door of death, have been the great barriers to the performance of these operations.

OVARIAN AND INTERSTITIAL EXTRAUTERINE GESTATION.—The symptoms, results, and treatment of these varieties are, in the main, not essentially different from those of tubal cases.

ABDOMINAL EXTRAUTERINE GESTATION.—The ovum in these cases is in the cavity of the peritoneum; its growth is not curtailed by any resisting muscular wall. The pregnancy may, therefore, go to the full term.

Diagnosis.—Nothing special occurs during early part of pregnancy, except that the uterus does not enlarge correspondingly with the duration of gestation. Attacks of pain in the abdomen may occur, due to localized peritonitis. Later, the movements of the child may be more easily felt, and the sounds of the fœtal heart more distinctly heard than in a normal pregnancy. Small size of uterus precludes possibility of its containing the fœtus.

Treatment.—Do nothing before full term; then, however, either "primary laparotomy" may be performed, with a view to save the child, or, the child being dead, the case may be allowed to remain without interference, until symptoms arise requiring "secondary laparotomy." Difference of opinion exists as to which course is best, but the balance of evidence is in favor of the secondary operation. Symptoms of labor (labor pains) come on at "term" as in an ordinary pregnancy. Soon afterward the child dies. It and the amniotic fluid may shrink and be absorbed, leaving a "lithopædion"—a most favorable result; or inflammation, abscess, and ulceration of the cyst-wall take place, with discharge of fœtus, piecemeal, through fistulous openings into neighboring cavities. During these processes, female is liable to exhaustion from continued discharges, and to septicemia. Hence, "secondary laparotomy" is the proper course to pursue after the child is dead and symptoms leave no hope of absorption and formation of lithopædion.

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[1] [illegible] "Cellular Pathology," p. 325) found the muscles of a fœtus perfectly [illegible]ining thirty years in the body of its mother.

HYDATIFORM PREGNANCY AND MOLES. (HYDATIFORM PREGNANCY.)—The fœtus dies *early*, dissolves and disappears, and then the villi of the chorion—the bulbous ends of their branches—become distended with fluid into little sacs or cysts of different sizes, which continue to increase in number till the uterus is filled. Technically, the disease is *cystic* (or dropsical) *degeneration of the chorial villi.* The cysts hang by long, narrow pedicles like diminutive elastic pears, or dangle from each other, suggesting a resemblance to serpent's eggs. Viewed *en masse*, they look like a bunch of grapes.

Causes.—It has been ascribed to constitutional syphilis; morbid changes in the decidua; early death of the fœtus, etc., but the question is yet unsettled.

It has been called *hydatiform pregnancy* from a crude resemblance to, and a former *erroneous* supposition that the cysts were identical with, *true* hydatids (entozoa, acephalo-cysts), such as occur in the liver and other organs (possibly in the uterus), but which have nothing to do with impregnation, or an ovum.

Remnants, or repeated new developments of the growth, may appear months or even years after impregnation. In women separated from their husbands, unpleasant complications might thus arise, and the case assume medico-legal importance.

Diagnosis of True Hydatids from Hydatiform Pregnancy.—In true hydatids the cysts develop, some *inside* of others, and the echinococci heads and hooklets may be seen with the microscope. This microscopic appearance is wanting in hydatiform pregnancy, in which, also, we have seen the cysts hang by stalks and increase by a sort of budding process—*not* inside each other.

Symptoms of Hydatiform Pregnancy.—The early signs of pregnancy follow impregnation as usual; but there are no positive or physical signs, for the child dies before the tenth week—often much sooner. Then follows extreme rapidity of uterine enlargement. At six months it is as large as a full-term pregnancy. The womb is unsymmetrical in shape; it is doughy or boggy to the touch, and no fœtus can be felt in it. Overdistention, between the fourth and sixth month, leads to contraction of the womb, accompanied with gushes of transparent watery fluid, from crushing and bursting of cysts. Hemorrhage—severe hemorrhage—may also occur.

Diagnosis is confirmed by finding characteristic cysts in the discharges, or the mass may have been previously felt in the os uteri.

Prognosis.—Generally favorable. The chief danger is hemorrhage.

Treatment.—Empty the uterus and secure its contraction as soon as safely practicable. Give ergot. Open the os uteri, if necessary, with a Barnes's or other dilator, and with the fingers or hand in the uterus, carefully extract the mass. Beware of rupturing the uterine wall; it may be very thin. While the os is dilating, a tampon may be necessary to check hemorrhage. Instead of using the hand, the mass may be broken up with a male metal catheter, and left to be expelled by uterine contraction, especially when the os is undilated.

After emptying the uterus its cavity should be washed out with a carbolic solution. If bleeding continue, wash uterine cavity with solution of perchloride of iron. To prevent recurrence of the growth, Dr. Barnes recommends painting the inside of the uterus with tr. iodin. one part, to glycerine five parts, once a week, for several weeks.

Moles are masses of some sort, developed in and expelled from the uterus. If the growth result from impregnation, it is called a "*true*" mole; if it occur independent of impregnation, it is a "*false*" mole.

True moles. The hydatiform pregnancy just described is a true mole. Another form—the "*fleshy mole*"—occurs after early death of the fœtus, from a sort of developmental metamorphosis of the fœtal membranes, mingled with semiorganized blood-clots, so as to form a more or less solid nondescript fleshy mass. Chorial villi may generally be discovered in it with the microscope.

Portions of the fœtal membranes, or of the placenta, may be left after abortion, and develop into true moles.

False moles. An intrauterine polypus, or *fibroid tumor*, or *retained coagula of menstrual blood*, or a *desquamative cast of mucous membrane* from the uterine cavity (membranous dysmenorrhœa), may be expelled from the womb, with pains and bleeding, resembling those of abortion or labor. Examination of the mass, its history, and absence of chorial villi, will be sufficient to indicate a correct diagnosis and shield the female, if unmarried, from any undeserved suspicions.

A desquamative cast from the *vagina* may occasionally occur.

These are so-called false moles; they seldom attain any considerable size. Treatment consists in securing their complete expulsion, by ergot and manipulation, with use of tampon to control hemorrhage should it be excessive.

DROPSY OF THE AMNION (HYDRAMNION, HYDRAMNIOS).—The normal quantity of liquor amnii (one to two pints) may be increased to five, ten, and even twenty or more pints. This is *hydramnion.*

Causes, not thoroughly understood. In some instances the cause is interference with return of blood to fœtus through umbilical vein, either from pressure on the cord (as in twins, or triplets), or from disease of fœtal heart, lungs, or liver obstructing circulation; hence association of hydramnion with syphilitic disease of liver of fœtus. It is seldom observed before fifth month.

Symptoms.—Abdomen unnaturally large from over-distended uterus; increase in size and weight of the latter lead to dyspnœa and palpitation, vomiting, dyspepsia, insomnia, and œdema of labia and lower limbs, together with neuralgic abdominal pain, and difficult locomotion. It may lead to, or be associated with ascites.

The uterine tumor will be found, on palpation, elastic and tense, with indistinct fluctuation. The fœtus is very movable, changing its position frequently: its heart-sounds are faint, or inaudible. Death of fœtus, and premature labor apt to occur.

Prognosis and Treatment.—One-fourth of the children are stillborn. Interference with respiration and other functions of the mother may endanger her life, unless rupture of the sac occur spontaneously, or the fluid be discharged by *artificially* rupturing it, which is about all that can be done by way of *treatment.* During labor beware of uterine inertia and hemorrhage; malpresentation; and prolapse of funis.

HYDRORRHŒA. (HYDRORRHŒA GRAVIDARUM.)—During the latter months of pregnancy (sometimes earlier) women observe a discharge of fluid from the vagina—either a perceptible gush or a continuous trickle or dropping—which they think is due to rupture of the bag of waters; yet, on examination, the bag is found *un*broken. The discharge may occur during rest, as after exercise or violence. This discharged fluid may have previously accumulated *outside* the bag of waters, between it and the uterine wall, and finally made its way to the os uteri; or it may have been formed *between* the chorion and amnion, and then escape through an opening in the chorion without the amnion being ruptured. Various other suggestions have been made with regard to it.

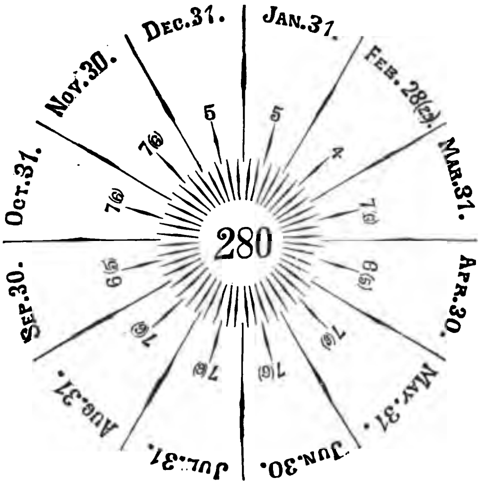
If the discharge be sudden and considerable in quantity, it may be followed with pain and premature labor. To prevent this we enjoin *absolute rest* and an *opiate*, taking care to avoid the mistake of hastening labor, under the impression that the waters have broken, when, really, they have not. By this treatment, (there is no other), pregnancy may go on to full term.

CHAPTER XI.

LABOR.

LABOR is the act of delivery or childbirth—parturition. The period after impregnation at which it takes place is ten lunar months or thereabouts (280 days). Children may be born alive earlier, as already explained, and exceptionally, the pregnancy may last as long as eleven or even twelve months. The *possibility* of these latter cases becomes important considered in a medico-legal point of view. For predicting the date of delivery in a given case there are several methods. The best is that of Nägelè, to wit: (1) Ascertain the day on which the last menstruation ceased; (2) count back three *calendar* months; (3) add seven days. For example: Menstruation ceased August 1st, count back three months—*i. e.*, to May 1st—add seven days, which brings us to May 8th, the probable day of delivery. It is the same as, but easier than, counting forward nine calendar months and adding seven days. To be *quite* exact, the number of days to be added will sometimes vary, as shown in the diagram constructed by Schultze. (See Fig. 29.) Thus if, after counting back three months we reach March, May, June, July, August, October, or November, the number of days to be added is *seven*; if April or September, *six*; if December or January, *five*; if February, *four*. Should the pregnancy include February of a leap-year, the figures contained in brackets are to be added, except when the counting back brings us into December, January, or February.

FIG. 29.



CAUSE OF LABOR AT FULL TERM.—A number of factors combine to provoke uterine contraction, chief among which may be mentioned gradual distention of the uterus near the end of pregnancy (not before), from the organ having reached the physiological limit of its growth, while the bulk of its contents still continues to increase.

Increased muscular irritability of the uterine walls, and exaggerated reflex excitability of the spinal cord probably occur toward the end of pregnancy, so that the uterus is excited to contract more readily; while the stimuli to contraction, viz., distention, motions of the child, stretching of the uterine ligaments, pressure of the womb on contiguous parts from its own weight, and compression of it by surrounding peritoneal and muscular layers, are all exaggerated.

When the presenting part of the fœtus distends and presses upon the neck of the uterus, contractions are excited (just as the bladder and rectum contract when their contents press upon and distend their respective necks), but, in labor, this is *after* the beginning, hence irritation of the sphincter (os uteri) cannot be considered the *primum mobile* of uterine contraction.

FORCES BY WHICH THE CHILD IS EXPELLED.—The main force is that of uterine contraction, which derives its power chiefly by reflex motor influence from the spinal cord; the secondary or "accessory" force, is contraction of the abdominal muscles and diaphragm. Uterine contraction is entirely involuntary, that of the abdominal muscles may be assisted by voluntary effort in the act of straining.

LABOR PAINS.—A labor pain is a contraction of the uterus lasting for a little time, and then followed by an interval of relaxation or rest. In the beginning of labor the pains are *short in duration* (a minute or less); feeble in *degree;* the intervals are *long* (half an hour or more), and there is no contraction of the abdominal muscles, or straining effort. As labor progresses, in the natural order of things, the pains gradually increase in duration, strength, and the amount of straining effort, and the intervals between them become shorter, up to the moment of delivery.

The *early* pains are called "cutting" or "grinding" pains, from the accompanying sensations experienced by the woman; and the later ones "bearing-down" pains, from the distressing tenesmus or straining by which they are attended.

In cases where there is no malproportion between the size of the head and pelvis, and other things are perfectly normal, there are still two great sphinctorial gateways which offer a certain amount of obstruction to the passage of the child, and the resistance of which must be overcome before delivery can take place; these are: (first), the *mouth of the uterus*, (second), the *mouth of the vagina*.

THE "BAG OF WATERS."—A natural arrangement is provided for the dilatation and opening of the resisting os uteri, by the gradual forcing into, and protrusion through it, of the most depending part of the amniotic sac, or "bag of waters." During labor pains, the contracting circular layers of uterine muscles compress the "bag" on all sides, circumferentially, thus tending to make it bulge out at the only point of escape (the os uteri); while the longitudinal muscular layers in the uterine wall shorten the womb, and thus tend to pull back, or retract, the ring of the os from off the bulging end of the protruding bag. The bag being soft, smooth, and elastic, can more completely fit and more easily dilate the os uteri, than any part of the fœtus, hence the importance of not breaking it during the early part of the labor. The *weight* of the contained liquor amnii probably assists dilatation, the female not being confined to a recumbent posture.

The bag of waters also protects the body of fœtus, placenta, and umbilical cord from the direct pressure of the uterine wall; and it allows the womb to maintain its symmetrical shape, thus lessening interference with the uterine and placental circulation.

LABOR IS DIVIDED INTO THREE STAGES.—The *first* stage begins with the commencement of labor, and ends when the os uteri is completely dilated.

The *second* stage immediately follows the first, and ends when the child is born.

The *third* includes the time occupied by the separation and expulsion of the placenta; it ends with safe contraction of the now empty uterus.

PREMONITORY SYMPTOMS OF LABOR.—Sinking of the uterus, with consequent relief to cough, dyspnœa, palpitation, etc., as previously explained (pages 117 and 121). Increased frequency of evacuations from bowels and bladder from pressure on them of the now sunken uterus. Commencing and progressive obliteration of the *neck* of the uterus. Occurrence of a viscid mucous discharge from the vagina (originating, however, chiefly in the cervix uteri) which may be tinged with blood; it is called "*the show.*" This last lubricates the soft parts and prepares them for dilatation.

Intermittent pain in the womb, due to feeble contractions, may occur a few days before the actual commencement of labor—sometimes weeks before.

SIGNS AND SYMPTOMS OF ACTUAL LABOR.—The characteristic signs are: 1. Labor pains; 2. Commencing dilatation of the os uteri; 3. Presence, or increase if previously existing, of muco-sanguineous discharge—the "show;" 4. Commencing descent into, or protrusion through the os uteri, of the bag of waters; 5. Rupture of the bag and discharge of liquor amnii.

PHENOMENA OF THE FIRST STAGE.—Feebleness and infrequency of the first "cutting" pains. Suffering during them is referred chiefly to the back. The woman walks about, if not prohibited from doing so; is restless, despondent, perhaps slightly irritable from discontent at progress being slow.

As dilatation of the os uteri progresses, the pains become "bearing-down" in character, and the pain in the back increases in severity. Nausea and vomiting occur during further dilatation, and probably assist it by producing relaxation. When dilatation is near completion, slight "shudders" or even severe rigors occur, but without any fever. Full dilatation of the os uteri is usually announced by rupture of the bag of waters during a pain and an audible gush of liquor amnii.[1] On vaginal examination we find simply progressive dilatation of the os uteri and protrusion of the bag of waters. The presenting part of the child may be felt through the unbroken sac. The duration of the first stage varies much in different cases; it is nearly always much longer than the other two stages combined, It is, indeed, a common observation that a longer time is required for the os uteri to dilate as large as a silver dollar than for all subsequent parts of the labor together. The first stage is usually longer in primiparous women, and still more so in primiparæ over thirty years of age. An os uteri that is soft, thick, and elastic, dilates more readily than a hard, thin, rigid one. Premature rupture of the bag of waters greatly impedes dilatation.

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[1] By some authors, rupture of the bag defines the end of the first stage of labor; it may, however, precede dilatation.

PHENOMENA OF THE SECOND STAGE.—Tremendous increase in the frequency, strength, duration, and expulsive or bearing-down character of the pains. Nevertheless they are more contentedly borne, from (supposed) consciousness of progress on the part of the female. The head of the child may now be felt descending into and beginning to protrude through the os uteri. It eventually slips through the os into the vagina, accompanied with renewed flow of some remaining liquor amnii. There may be a momentary pause in the suffering, and the woman may exclaim, "Something is come!"

The head now pressing upon sensitive nerves in the vagina, elicits still more reflex motive power from the spinal cord, and the pains are still longer, stronger, more frequent, and expulsive. The corrugated scalp of the child, swollen and œdematous (constituting the *caput succedaneum*) successively approaches, touches, and begins to distend the vulva and perineum. The anus is dilated and everted, fecal matter is forced out, the perineum is stretched more and more until its anterior border is almost as thin as paper, and at last, in a climax of suffering approaching frenzy, the equator of the head slips through the second sphinctorial gateway (the os vaginæ), and the head is born. A moment or minute of rest may follow, and then, with one or two more pains, the body of the child is expelled, and the second stage of labor is over. The duration of the second stage largely depends upon the dilatability of the perineum. In a natural case, other things being equal, a soft, thick, elastic perineum, with abundant mucous discharge, in a young and multiparous woman, will dilate sooner than when opposite conditions prevail.

PHENOMENA OF THE THIRD STAGE.—By the time the child is fully expelled the placenta is separated from the uterine wall and lying loose in the now contracted uterine cavity. The womb may be felt as a hard, irregularly globular ball above the pubis. There may be an interval of one-quarter or one-half of an hour's rest from pains, if the case is left entirely alone. Then, sooner or later, gentle pains again come on, the placenta is doubled vertically, the fœtal surface of one-half in apposition with that of the other, and the organ protruded endways into the vagina, from whence it is, by other slight pains, finally expelled, together with some blood, remains of liquor amnii, membranes, etc. The womb now contracts into a distinctly globular, hard mass, no bigger than a cricket ball, thus effectually closing the uterine bloodvessels and preventing hemorrhage, which last is further stopped by coagulation of blood in the mouths of the open blood-channels. Thus ends the third stage of labor.

THE AVERAGE DURATION OF LABOR IN NATURAL CASES is about ten hours. It may be over in one or two hours, or last twenty-four or longer without any bad consequences.

MANAGEMENT OF LABOR. PREPARATORY TREATMENT.—In anticipation of approaching labor precautions against constipation, by mild laxatives (castor oil, manna, rhubarb) may be necessary to prevent fecal accumulation in lower bowel. Moderate exercise, as far as practicable in the open air, and cheerful social surroundings, to mitigate despondency. Physical and mental excitement must be avoided. Ascertain whether urine is voided freely; if not, use male elastic catheter.

PREPARATION FOR EMERGENCIES.—On being called to labor case, the physician should attend *without delay*, and take with him *always* the following articles:

1. A pair of obstetric forceps.
2. Fluid extract of ergot, f℥j.
3. Hypodermic syringe.
4. Magendie's solution of morphia, f℥j.
5. Liq. ferri persulphatis, f℥ss.
6. Needles, needle-holder, and sutures.
7. Male elastic catheter.
8. Davidson's syringe.
9. Sulphuric ether, Oss. This last, being bulky, may be omitted, if it can be obtained within easy distance of the patient.

Physicians do not generally carry all these things, and probably never will until compelled so to do, as they should be, by law. Most of the articles may be seldom wanted, but emergencies known to be probable should be anticipated.

EXAMINATION OF THE PATIENT.—*First.* Verbal examination, in as gentle and pleasant a manner as possible, into the childbearing history of the patient, as to number (if any) of previous labors; their character, duration, and complications (especially as to flooding after delivery). Symptoms during present *pregnancy,* if not already ascertained. Has it reached full term? Present symptoms of labor? Pains—their frequency, severity, character, and duration? Character of the flow? Has the bag of waters broken?

Second. Abdominal examination, to ascertain, by palpation, the size and shape of gravid uterus. In cross presentation, the shape of the abdomen may lead us to anticipate it and to take additional care in making examination *per vaginam.* Multiple pregnancies, coexisting tumors, amniotic dropsy, etc. may be thus discovered or suspected, in the same manner.

Third. Vaginal examination. To the young practitioner who may experience some embarrassment with his first vaginal examination, the following suggestions may be of service.

In labor cases it is *not* necessary to obtain *verbal* consent of the patient before instituting the examination. Proceed (the woman being in bed) without hesitation as if consent had already been obtained. Having been sent for to attend her is a sufficient guarantee of this. If anything is to be *said* on the subject, some such remark as "Well, we'll see how you are getting on"—suiting the action to the word—will be amply sufficient; or a simple inquiry as to the convenience of soap, water, and towel may be enough to introduce the subject and indicate one's purpose. The less said the better. Proceed, *without hesitation,* just as in feeling the pulse. Should the woman cry, demur, and declare she cannot submit to the examination, proceed just the same, meanwhile addressing to her any kind word of encouragement that may serve to lessen fear or embarrassment. Nothing but *physical* resistance on the part of the female should induce the physician to give up the examination. This will seldom occur; when it does, there is nothing to do but withdraw from the case, or the announcement of this *intention* will generally remedy the difficulty.

Should the patient be dressed and sitting up, she must be requested to go to her room and lie down in order that the examination may be made. Instruct the nurse to place her near the edge of the right side of the bed, that the right hand may be conveniently used. The physician to be notified when she is ready.

POSITION OF THE WOMAN.—On the back, with the knees flexed, is the obstetric position most common in the United States. Some practitioners prefer the English position, the woman lying on the left side near the right edge of the bed, with her knees drawn up.

INTRODUCTION OF THE FINGER.—Anoint the right index finger with lard, oil, or vaseline. Fold it in toward the palm and shield it with the thumb and middle finger from greasing the bed-clothing (which must be previously loosened or untucked), while reaching the vulva. Pass the hand under—never over—the thigh, the knees having been previously flexed; separate the labia, and introduce finger rather toward posterior than anterior commissure, with care to avoid inverting any hair. The index finger will reach higher in the vagina if the remaining fingers are (not doubled into the palm, but) stretched out over the perineum so that the posterior commissure fits into the deepest part of the space between the index and middle fingers. The perineum may be thus pushed in, or lifted somewhat upward and inward, when there is any difficulty in reaching the os uteri.

PURPOSES OF VAGINAL EXAMINATION.—By this examination we learn:

1. The condition of the vagina and vaginal orifice as regards their patency and freedom from obstruction to the passage of the child; also their temperature, sensibility (freedom from tenderness), and moisture.
2. Corroboration of the existence of pregnancy if not previously ascertained by physical proof.
3. Condition of the os uteri—its *degree of dilatation*, thickness, consistency, and elasticity.
4. If labor have actually begun.
4. To what stage it has progressed.
6. Whether the bag of waters has ruptured.
7. What the presentation[1] is.

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[1] The term "presentation" has not yet been defined. It means that part of the child which "presents" at the os uteri or superior strait.

8. The condition of the pelvis, whether normal or deformed.
9. The state of bladder and rectum as to distention with their respective contents.

When accustomed, by practice, to the examination of *normal* vaginæ, pelves, etc., the existence of any *abnormality* is readily appreciated by the finger without any particular attention being given to each of the details just enumerated. In commencing practice, much more care is necessary to avoid overlooking existing departures from the natural state.

In learning the degree to which the os uteri is dilated, it is the size of the *circular rim* (or lips) *of the external os* that we wish to ascertain. Without care the finger may be passed through a *small os* uteri and swept round a considerable surface of the presenting part or amniotic sac, thus conveying an impression that the os is dilated when it is not. Finding a small, hard, easily movable uterus, *per vaginam*, at once negatives the existence of advanced pregnancy, unless it should happen to be an extrauterine case. A pregnant woman may imagine herself in labor when she is not, owing to the occurrence of "*false pains*." These, on vaginal examination, are found to be *un*accompanied with hardening and contraction of the os and cervix uteri at the *beginning* of a pain. A "*true*" labor pain *does* begin with contraction and hardening of the cervix—the contraction begins below and goes up. False pains further differ from true ones, in being irregular in their recurrence and not progressive in strength, duration, and frequency. False pains produce uneasiness in the fundus, true ones in the lumbar and sacral regions. A false pain is a transient spasmodic contraction of fundus only, and is not attended with greater prominence of bag of waters, as is the case with true pains. False pains are generally produced by some source of reflex irritation in the intestinal canal, and are usually relieved by a laxative, an opiate being given after its action. The diagnosis of a head presentation may be made out even before the os is dilated. The hard, smooth globe of the head may be recognized through the wall of the uterine cervix. There is nothing else like it. Generally the os will admit a finger, when the cranium, if not too high up, may be readily felt, covered by the membranes. It is not always easy to ascertain whether the membranes have ruptured. Statements of woman or nurse are not reliable. If there is a layer of liquor amnii between the head and membranes, the space and fluid may be readily recognized by gentle pressure with finger *between the pains.* Not so when the membranes closely embrace the head. Then feeling the child's hair, and corrugation of the scalp during a pain, show the bag has broken. The membranes, on the contrary, become smooth and tense during a pain, possibly wrinkled a little in the intervals.

OPINION AS TO TIME OF DELIVERY.—After one examination only, no opinion as to the duration of labor can be confidently formed, certainly none should be expressed. Having felt the head, we may say, "everything is right," and encourage the female not to despond. After a second examination in twenty or thirty minutes, we may *form*, but should not express, an approximate idea as to time of delivery, by degree (if any) of progressive dilatation that may have taken place.

PREPARATION OF THE WOMAN'S BED.—Let it be anything rather than a feather bed—a firm mattress is best. Place it so as to be approachable on both sides. Cover it with a sheet. Place upon this, at a point where the woman's hips will rest, a piece of rubber (or other water-proof) cloth, four feet square. Upon this cloth lay an old blanket, doubled three or four times, until it is somewhat less in size than the rubber. Cover all over with a second sheet, the top border of which must be "turned down" a foot or two below the pillow. Upon this second sheet the woman lies.

Pillows, and a third sheet, with quilt, etc., for covering, may be put on as usual.

When labor is over, the rubber cloth, with its soddened blanket and soiled sheet (No. 2) may be easily dragged off at the foot of the bed, leaving the patient resting upon the dry sheet first placed over the mattress.

ARRANGEMENT OF THE NIGHT-DRESS.—Its skirt should be rolled up to the level of the armpits or a little lower, so as to be out of the way of vaginal discharges, while a thin petticoat, or light flannel skirt, covers the parts below the waist. When labor is over, the soiled skirt may be readily removed over the feet, without lifting the patient, and the dry nightgown then pulled down from above.

IS IT NECESSARY TO KEEP THE PATIENT IN BED DURING THE FIRST STAGE?—No. Let her sit, walk, or change her position as she desires, until the bag of waters is about to break, when recumbency is desirable to prevent washing down of the umbilical cord by the gush of liquor amnii, and for other reasons.

RUPTURE OF THE BAG OF WATERS.—Just *before* rupture the female should be told what is going to happen, to prevent alarm, especially if she is a primipara, and an extra cloth or piece of blanket may be placed under her, to soak up the bulk of the flow. Just *after* rupture, a vaginal examination should be made to ascertain more surely the presentation, and that no change has taken place in it, and the sutures and fontanelles may now be felt, and the "position"[1] of the head made out. The extra cloth may be removed at once.

NUMBER OF ATTENDANTS.—It is not desirable for the physician to remain in the lying-in room during the first stage of labor. After having seen that every preparation has been made, and having expressed a willingness to be called at any time the woman may desire, let him retire to some other apartment. One nurse is necessary, and an additional attendant or relative not objectionable, but no others. The husband may be present or not, as the wife prefers.

PRECAUTIONS DURING EARLY STAGE.—If the rectum is loaded, administer an enema of soap and water to empty it. See that the bladder empties itself. If not, use a catheter. Protect the female from a glare of light, whether by day or night. Keep the temperature of the room at 65° or 70° F., if practicable. Instruct the patient *not* to strain or bear down during the first stage; it does no good, and tires her.

PINCHING OF THE ANTERIOR LIP OF THE OS UTERI.—As the head passes out of the uterus into the vagina, the lower margin of the os uteri slips up out of reach of the finger, but sometimes the anterior lip of the os gets pinched between the child's head and pubic bones so that it cannot slip up. It may then become greatly swollen, congested, and œdematous. *Treatment:* push it up with the ends of two fingers between the pains, and hold it there till the next pain forces the head below it.[1]

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[1] "Position," in obstetrics, means the positional relation existing between a given point on the presenting part, and certain fixed points on the pelvis. There are several "positions" to each "presentation," as will be explained hereafter.

THE PERINEUM may require attention to prevent rupture. There is no fear of laceration so long as the anterior border of it maintains any considerable thickness and is not fully on the stretch during the pains. Hence, no "support" is necessary, and nothing is required but to watch the progress of the head (now easily touched inside the vulva), and ascertain when the perineum *does* become thin and tightly drawn out over the advancing head, and when there *is* danger of laceration, especially if the labor progress *rapidly*. *Treatment:* ask the woman *not* to bear down any more than she can help; impede the too rapid progress of the head by pressing it with the finger: relax the perineum by hooking a finger in the anus and pulling it toward the vagina (Goodell); or, by placing the palm of the hand over the anus, so that the distended globe of the perineum rests between the outstretched thumb and fingers, then, during the pains, gently lift or push the perineal margin upward and forward toward the pubes (Playfair). Again: placing the patient on her left side, and standing behind her, the first two fingers of the right hand may be applied to the occiput, and the thumb pushed into the rectum, and thus the head, held completely under control, may be forced out between the pains, at the will of the operator (Fasbender). Intermittent distention of the perineum, between the pains, by the head, when thus drawn down, will often overcome obstinate rigidity.

In the *very rare* cases where, despite these manipulatory devices, rupture appears *inevitable*, the operation of *episiotomy* —*i. e.*, dividing the restricting ring formed by the muscles of the pelvic floor and by the constrictores cunni, by *lateral* incisions of the vaginal wall, three-quarters of an inch in length, at a point half an inch anterior to the posterior commissure—may be justifiable. Such incisions heal, after labor, more readily than rents in the median line, inasmuch as their edges are not pulled apart by the transverse perineal muscles.

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[1] The author considers it probable that this accident is produced, in part, by a too rigid adherence to the horizontal posture during labor, which tilts the fundus uteri toward the spine, and the os forward toward the pubes; whereas, if a kneeling, sitting, or squatting posture *could* be adopted, the fundus would be thrown forward, and the os directed more centrally and in a line with the pelvic axis. This, however, requires proof.

BIRTH OF THE HEAD.—When the head is expelled, feel with the finger if the umbilical cord encircles the child's neck. If so, draw down the cord from whichever direction it will most freely come, and pass the loop of it thus formed over the head. See that nothing impedes the further free motion of the head. Keep one hand on the womb, and, by gentle pressure, follow down its decreasing size, so as to assist its contraction and prevent hemorrhage. Support the head in the other hand, and, as another pain or two expels the shoulders and body, gently lift it in a direction continuous with the axis of the pelvic curve—*i. e.*, *slightly* upward. No traction is necessary generally; and though the child's face begin to get bluish, there is no necessity for haste, nor fear of suffocation, even though delayed several minutes, which it rarely will be, before complete expulsion. *After expulsion of the child*, cleanse its nostrils and mouth from mucus, etc., and see that it breathes. If it does not, slap the buttocks (not roughly), rub the spine, dash a little water in the face or on the chest, which will generally suffice in an ordinary case. When respiration is established, let the infant rest on the bed between the thighs of the mother, preferably on its right side or back, avoiding contact with discharges, while the navel string is attended to. No haste is necessary in tying and cutting the cord; unless relaxation of the uterus, flooding, or some other condition of the mother, require immediate attention from the physician.

MANAGEMENT OF THE NAVEL STRING.—Ligatures—previously prepared by taking three or four feet of strong undyed thread, doubling and redoubling it, twisting it into a string and tying a knot at each end—should be in readiness. Cut the cord with scissors, one and one-half inches from the umbilicus. Pinch the stump of the cord near its root with the thumb and finger of one hand, and with those of the other squeeze out its distal extremity, by a sort of milking process ("stripping"), any excess of Wharton's gelatin, and tie it near the end tightly, but not tight enough to wound the blood-vessels. If the end bleeds, put on another ligature just above the first one. There is no necessity for putting a ligature upon the placental end of the funis, unless twins are suspected, when it should be done.

Ascertain the sex of the infant; examine it for deformities or malformations give it to the nurse, who holds a warm flannel or blanket for its reception; and caution her to let no strong light glare in its face, and to get no soap in its eyes.

Delivery of the Placenta.—The child having been disposed of, place a hand upon the fundus uteri. If it be found symmetrical in shape, and as small in size as a cricket ball, the placenta is probably resting loose in the vagina. If it be larger than this, and not so symmetrically globular in shape, the placenta is most likely still in the womb, or half in and half out. In this latter case manipulate the fundus and make pressure upon it to excite contraction, meanwhile asking the woman to bear down when she feels the pain begin. Should there be any bleeding, the fundus may be grasped firmly by the hand, and the placenta literally squeezed out of the uterus into the vagina, after the manner of Credè. To be successful in this manœuvre, the uterus must be grasped bodily by the thumb and fingers so that the fundus rests in the palm, and firm pressure made only *during uterine contraction*—at the *height* of a labor pain. Hold the womb continuously, but less firmly, between the pains, and resume strong pressure as the pain returns, and so on for six or seven pains, if necessary —the *direction* of pressure being downward and backward in line with axis of uterus. In cases where there has been a history of flooding in previous labors, it will be well to give a teaspoonful of fld. ext. of ergot immediately after the child is born or a few (15) minutes before, when we are *certain* the child will be born so soon—to insure contraction of the womb and expulsion of the placenta.[1] When the placenta has passed entirely through the os uteri into the vagina, it is easily extracted by hooking into it one or two fingers and making traction. When it is only half-way through the os, the index and middle fingers are passed up to it, following the cord for a guide, and the organ being grasped between the finger-ends, it is made to bulge completely through the os by directing traction *backward* toward the sacrum, the other hand compressing the fundus, and the woman being told to bear down. Never, under any circumstances, make traction on the cord. It tends to pull the placenta flatways (like a button in a button-hole), thus obstructing its egress, and might, if the placenta were still adherent, invert the womb. When undisturbed by traction on cord the placenta will be folded vertically, in line with long axis of womb, as shown in Fig. 30.

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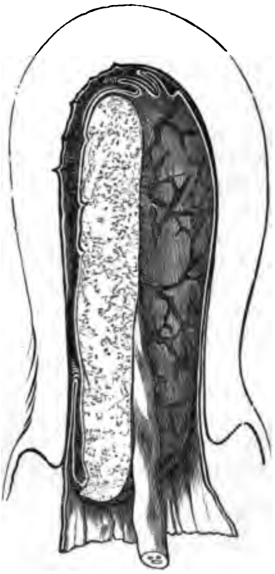
[1] Recent authorities affirm that ergot should *not* be given *before* delivery of the placenta, on account of its liability to produce, in rare instances, hour-glass contraction.

FIG. 30



Normal doubling of placenta, after Duncan.

As soon as the organ has passed the vulvar orifice, hold it there, close up, and with both hands twist it round and round, always in one direction, and the membranes will thus be twisted into a sort of rope, which gradually gets longer and narrower until terminating in a mere string which finally slips from the vagina, and delivery is complete. If this twisting device be not adopted, a part of the membrane is likely to remain, and, becoming entangled with clots of blood, cause after-pains, and come away, fetid, days afterward, not without alarm to the patient.

After delivery the placenta should be inspected to see that no part has been torn off and left behind, and then deposited in the vessel held by the nurse for its reception.

Once more feeling the fundus uteri to reassure himself that the womb is well contracted, the physician may leave the room while the nurse removes the soiled blankets, etc., and cleanses the female, getting her ready for the "binder," which is then to be applied by the physician himself. Before it is put on, the perineum should be examined for laceration (by ocular inspection if any doubt exist), and if any be found, one or two silver sutures should be put in to draw the raw surfaces together; they may be removed in a week (see Chapter XXVI.).

THE BINDER is an abdominal bandage designed to support the stretched walls of the abdomen, and compress the uterus so as to prevent its relaxation and consequent hemorrhage. It gives the female comfort, and prevents syncope. It scarcely improves her figure as was once supposed.

It may be made of strong unbleached cotton or jean, and must be wide enough to reach from *below the projecting trochanters* (otherwise it will slip up) nearly to the ensiform cartilage; and long enough to go once around the body and overlap enough for fastening with strong "safety-pins." Let there be no creases under the back. Pin it, from above downward, where the ends meet in front of the abdomen, as tight as may be comfortable. A warm napkin is then placed, by the nurse, under the perineum and vulva to receive the discharges, and the woman let alone to rest.

ATTENTIONS TO NEWBORN CHILD.—The nurse anoints it with olive oil, and then washes it with mild soap and water, to remove the *vernix caseosa*—an accumulation of whitish sebaceous matter—from the skin, especially plentiful about folds and creases. It is most abundant in over-long pregnancies.

DRESSING THE STUMP OF THE CORD.—It is an old *custom*, still prevailing, to draw the stump of the funis through a hole made in the centre of a bit of greased rag, then fold the borders of the rag over, and after laying it upon the abdomen with the end downward, place one or two belly-bands round the child to keep it in place.

This old-fashioned custom is not by any means a good one. It is inconvenient, as well as uncomfortable and injurious to the child. If there be no defective development of the abdominal walls, the infant needs no artificial support by belly-bands, and the cord is better left without any dressing at all except a little raw cotton (borated, or mildly carbolized) to absorb its moisture and prevent sticking to the clothing. The stump falls off in *about* five days.

CHAPTER XII.

MANAGEMENT OF MOTHER AND CHILD AFTER DELIVERY.

THE condition of being in "child-bed," whether during or shortly after parturition, is known as the "Puerperal State" (from "*puer*," a child, and "*parere*," to bring forth). Hence, certain diseases following labor are called "*puerperal*" fever, "*puerperal*" peritonitis, etc.

These more serious puerperal affections—not of frequent occurrence—will be reserved for a future chapter.

At present, only the more trivial and common accompaniments of lying-in will be considered.

GENERAL CONDITION OF LYING-IN WOMEN.—A moderate amount of fatigue, exhaustion, and nervous shock follows every labor, being more marked in long and painful ones. In normal cases, rest and the mental stimulus of joy that a child is born into the world, and that the trouble is over, afford an adequate antidote.

The pulse, after delivery, diminishes in frequency, dropping to 70, 60, 50, or even lower. A slow pulse is of favorable augury—not so a frequent one.

The temperature slightly rises, within twelve hours, and may remain somewhat elevated for five or six days. Lusk and Schröder consider 100½° within the normal limit during this time. The temperature remits, being highest about 5 P. M., and lowest at about 11 A. M. Owing to a difference in temperature between the blood in the internal organs and that in the skin, which occurs just after the birth of the *child* (and before the placenta is expelled), due to evaporation of sweat, exposure of the skin, and cessation of muscular effort, the woman may be seized with rigors, (chilliness, trembling, chattering of the teeth, etc.),—the so-called "*post-partum chill.*" It passes off in a few minutes, without any ill effects, under the application of warm clothing, and perhaps, a glass of wine.

The Lochia—Lochial Discharge.—It is a discharge from the uterus following labor, consisting during the first two or three days of blood, mixed with mucus and remnants of decidua. The red (blood) color gradually changes to a yellowish or pale green tint, and the flow is thinner and less in quantity. It continues to diminish in quantity, consistency, and color, becoming at last serous or watery, ceasing altogether in two or three weeks, varying in different cases.

Treatment.—Generally none further than the application of napkins (by the nurse) for its reception, and cleanliness. Should it be prematurely suppressed, as may occur from cold, mental emotion, etc., warm poultices may be applied to the hypogastrium and vulva, and a warm foot-bath given, to promote its return. If these be insufficient, and there are headache and other symptoms resembling suppressed menstruation, give gentle saline laxative, and a diaphoretic (liq. ammon. acetat. ℥ss every two hours).

The lochial discharge often has a disagreeable odor, but this, unless excessive, or distinctly putrescent indicating retention of decomposing blood-clots, requires no treatment. If it *is* putrescent, use tepid antiseptic vaginal injections twice daily. Of late, more decided antiseptic precautions have been employed and recommended in *every* labor case, especially in hospital practice, and the consequent reduction of mortality in maternity hospitals has been most remarkable. Not only the vagina, but the *uterus*, is washed out with tepid carbolic water (ʒij to the pint), or corrosive sublimate solution (1 to 2000), immediately after delivery; or a suppository (so-called "bacillus") of iodoform, 2½ inches long, is pushed up into the womb, beyond the internal os and allowed to remain. The formula is as follows: ℞. Iodoform 20 grammes; gum arab., glycerinæ, amyl. pur., āā 2 grammes. M. Ft. suppos. No. iii. Introduce into cervix with polypus forceps and push further in, with finger in vagina. Iodoform gauze, or a pad of antiseptic cotton, is then applied to vulva. The uterine injections for *every case*, can scarcely be advised in general practice. They and their mode of application will be fully considered in discussing puerperal septicemia (Chapter XXXIII.).

After-pains.—These are painful contractions of the uterus following delivery, for three or four days. Often caused by retained blood-clots or membranes, owing to uterus having been imperfectly contracted after expulsion of placenta. Seldom occur in primiparæ. Are worst in short, inactive labors, and in cases where the uterus has been over-distended.

Treatment.—Digital removal of clot if it can be felt lodged in the os uteri. Ergot to secure firm uterine contraction and expulsion of any retained secundines, and anodynes to relieve pain. A laxative enema, the woman sitting up during its action (there being no contraindication to this proceeding, from previous hemorrhage or weakness), will often empty the uterus and secure its firm contraction, relieving after-pains. Subsequently a morphia suppository should be given, if required. Relief often follows warm poultices (preferably of hops) to the hypogastrium.

After-pains are sometimes due to neuralgia of the womb. The organ is tender to the touch, but there is no general tenderness of abdomen, and no fever. Treatment: quiniæ sulph. gr. x–xv.

They also occur from reflex irritation every time the child is put to the breast. Time and patience will relieve this. To lessen suffering give potass. bromide gr. xx; also anodyne liniments to breasts.

SUCKLING THE CHILD.—The infant may be put to the breast as soon as it is washed, dressed, and ready for the mother, provided she is not over-tired. If she is, let her rest for an hour or two. The child may nurse about every four hours, during the first day or two, before the flow of milk begins. After then, more frequently, every *two* hours, except from 11 P. M. to 5 A. M., when the mother should be allowed continuous sleep.

The flow of milk is not usually established until the second or third day after delivery. During these first days there is, however, a little imperfectly formed yellowish milk, known as the "colostrum" (see page 60), which is enough for the infant without the addition of any artificial food, and acts upon it as a laxative to remove the "meconium," or native contents of the intestinal canal, consisting of unabsorbed bile, mucus, etc.

LAXATIVES FOR THE INFANT.—If the child's bowels fail to move spontaneously, which is rare, a little "pinch" of brown sugar dissolved in a teaspoonful of water may be given; or half a teaspoonful of olive oil. Before giving any laxative it must be known that the child is not suffering from imperforate anus. If the mother is constipated, laxatives given to her will reappear in the milk, and operate on the child.

The Infant's Urine.—If upon inquiry the child is reported not to have passed urine during the first day after delivery, examine the urethra and meatus for congenital deformity; feel, above the pubes, whether its bladder is distended, and ascertain that the urine has not been voided in the bath unawares.

If the bladder is full, a sprinkle of cool water on the hypogastrium, or a teaspoonful internally, or a warm bath, may answer. A very small elastic catheter may, very rarely, be required.

The Mother's Bowels.—Laxatives during the first two or three days after labor are not necessary, if the bowels were freely open before delivery. Otherwise an enema of castor oil with soap and water should be administered, or a dose of rhubarb (pil. rhei comp. no. ij–iij). In case a more active purgative be needed, the much commended "*post-partum pill*" of Dr. Fordyce Barker may be given, thus: ℞. Ext. colocynth co. ℈j; ext. hyoscyam. gr. xv; pulv. aloes soc. gr. x; ext. nuc. vom gr. v; podophyllin, ipecac, āā gr. j. M. Ft. pil. no. xii. S. Take two at once.

The Mother's Urine.—The urine may be wholly or partially retained from swelling of the urethra, or want of contraction and loss of sensibility in the bladder. Relieve by the catheter three times a day until the parts resume their normal function. Ergot internally stimulates cystic contraction. Hot applications (sponges) to the pubes, or laving the vulva with warm water, may afford relief.

The Mother's Diet.—The "toast-and-tea" starvation system after delivery is injurious and obsolete. Give any easily digestible food—soft-boiled eggs, milk, meat-soups, bread, potatoes—but in moderate quantity, avoiding solid meats until after the milk secretion has become established.

Milk Fever is a transient, slight, febrile excitement, preceded by chilliness, attending the establishment of the milk secretion. It scarcely requires treatment, and is far less frequent and severe now, than when the toast-and-tea diet system prevailed. Occasionally, in debilitated women, a distinct rigor, high fever, and sweating occur; but once only —the patient is well next day.

Sore Nipples. "*Chapped Nipples.*"—The apex and sides of the nipples are affected with fissures like a chapped lip. There are great pain and some bleeding during suckling; pain on touching nipple; fissures visible on inspection; in severe cases, fever. The agony of suckling may lead to accumulation of milk, followed by inflammation and abscess of the breast.

Treatment.—Preventive: Caution the woman against flattening her nipples by pressure of corsets. Harden them during later weeks of pregnancy by frequent applications of alum, or tannin, and brandy, carefully avoiding sufficient mechanical irritation to produce premature contraction of the uterus.

Curative: While nursing, use a nipple-shield—one with a hard base and rubber mouthpiece. Cleanse the part afterward with tepid water, and apply tannin and glycerine āā ʒiij. The compound tincture of benzoin, applied with a brush, leaves a film over the erosion, lessens pain, and promotes healing. Each fissure may be touched twice daily with solution of argent. nitras gr. xx, to water ℥j, by means of a *very fine* camel-hair pencil. Wet the fissures *only*, not the whole nipple, with the silver solution. Prof. Barker strongly recommends nitrate of lead gr. x–xx to an ounce of simple ointment, both as a preventive and curative agent. Many other remedies have been employed.

For slighter and more superficial irritations of the nipple, without ulcers or fissures, cleanse and dry them after each act of suckling, and dust with powdered oxide of zinc, or gum arabic. Another plan is to keep them moistened with a rag wet with Goulard's extract ʒij, to water Oj, carefully washing it off before nursing the child.

Sunken Nipples.—The nipple is too flat, short, or sunken for the mouth of the child to grasp. The infant attempts to nurse, fails, and turns away crying. *Treatment:* Hold the child in readiness while the nipple is first drawn out by the mouth or fingers of an adult, or breast pump, and then apply it promptly. Another plan: Hold over the nipple the mouth of an empty glass bottle whose contained air has been previously rarefied by heat, till the air cools, and the nipple is drawn up into the neck of the bottle. Then remove it and apply the child immediately.

EXCESSIVE FLOW OF MILK.—The breasts overflow, or become tender, hard, and distended from accumulation of milk. Danger of inflammation and abscess, if not relieved. *Treatment:* Restrict the woman's diet to dry food, as far as possible, abstinence from fluids. Laxatives, preferably salines, to produce watery stools and reduce the fluids of the blood. Diaphoretics (liq. ammon. acetat. ℥ss every two hours) to produce watery secretion from the skin. Locally, ℞. ext. belladonnæ ʒj, liniment. camphor. ℥j. M. Sig. Apply to breasts with gentle friction of the hand.

Large doses of potass. iodid. (gr. xx three times a day) with rigid enforcement of dry, abstemious diet, and moderate, continued compression of the breasts with adhesive plasters, will soon *entirely stop* the secretion of milk, as may be necessary when the child dies, or the mother is not able to nurse.

DEFICIENT MILK-FLOW.—When due to anemia, debility, or hemorrhage, build up the patient with iron, quinia, bitter tonics, and nutritious fluid diet, especially *milk;* as a direct galactogogue use fomentations of the leaves of the castor-oil plant[1] to the breasts, or a teaspoonful of the fluid extract may be taken three times a day. The application of electricity has been recently employed with some success as a galactogogue.

ARTIFICIAL FEEDING.—If the mother cannot nurse her infant, it must be nourished by a wet-nurse. When none can be obtained, give cows' milk one part (by measure), to two parts of water, adding a small lump of white sugar, or, preferably, the sugar of milk ʒij, to each pint of the mixture; the proportion of milk to be increased with age. When this food disagrees, and the child passes lumps of undigested curd, use lime-water, instead of ordinary water, or give one grain of potass. bicarb. in each fluidounce of the mixture.

[1] Preferably the *white* variety; the *red* is said to be emmenagogue.

INFANTILE JAUNDICE. (Icterus Neonatorum.)—A common affection during the first week of infant life. *Symptoms:* Yellow skin and conjunctivæ; high-colored urine; light-colored stools. *Causes:* (Not well understood.) The tight application of belly-bands, restricting the respiratory motions of the abdominal walls and diaphragm, upon which the portal circulation chiefly depends, is probably a factor in the production of the disease. *Treatment:* Nothing further than the removal of belly-bands may be necessary in slight cases. It soon goes away. In severe cases, with constipation, give calomel one-sixth of a grain, with one grain of white sugar, in powder, three times a day, for one or two days, followed by a teaspoonful of olive or castor oil.

SORE NAVEL.—An ulcer, usually with sprouting, flabby granulations, remains after falling off of stump of funis. Usually caused by friction and pressure of bandages, etc., used in dressing the cord. *Treatment:* Remove all dressings, and dust ulcer with a pinch of calomel, or touch it with crystal of cupri sulphas or argent. nit.

SECONDARY HEMORRHAGE FROM THE UMBILICUS.—A dangerous and often fatal bleeding from the navel, coming on days, or even weeks, after delivery, and recurring (sometimes) again and again, in spite of styptics, ligatures, the actual cautery, and other means that must be promptly tried for its relief.

HOW LONG SHOULD THE MOTHER KEEP HER BED AFTER LABOR?—The popular, conventional rule is *nine days.* It is a custom without reason. Some strong, vigorous women, with healthy and well-contracted uteri, might get up sooner; others require a much longer period. Everything depends upon the character and complications of the labor, the strength of the female, and the condition of her uterus. Too early getting up, while the womb is large and heavy, and its natural supports relaxed from the stretching of pregnancy and labor, endangers uterine displacements, congestion, and subinvolution. It is better to err on the safe side, by making the lying-in too long, than to risk too early rising.

CHAPTER XIII.

MECHANISM OF LABOR IN HEAD PRESENTATIONS.

By the mechanism of labor we understand the manner of its accomplishment, forces and the exercise of the mechanical movements necessary to the passage of the child through and out from the pelvis, or rather, parturient canal.

In [illegible] there are six *presentations* to be considered, viz:

1. Head presentations.
2. Face "
3. Breech "
4. Knee presentations.
5. Feet "
6. Transverse "

POSTURE OF CHILD IN UTERUS.—The position of the child *in utero* is very much that of an adult, when trying to keep warm in a cold bed before going to sleep, viz.: the spine curved forward, the face bowed toward the chest, the thighs flexed upon the abdomen, the legs toward the thighs, and the arms flexed and folded across the breast. The child, *in utero*, thus flexed and folded, is more compact and occupies less space than it could do in any other posture: its whole frame approaches the *ovoid form* of the uterine cavity in which it reposes.

Now, when either *end* of this fœtal ovoid presents, other things being normal, delivery is mechanically possible. When it presents *crossways*, delivery is impossible. Hence, presentations of the head, face, breech, knees, and feet, may be considered *natural* presentations; while transverse presentations are *preternatural*. Sometimes head and face presentations are called "cephalic" presentations, because the cephalic (or brain) *end* of the ovoid presents; while breech, knee, and footling presentations are termed "pelvic" presentations, because the pelvic or caudal *end* of the ovoid comes first. The long spinal column *must* come one end first—either head or tail.

HEAD PRESENTATIONS.—Cases in which the head presents at the os uteri or pelvic brim.

THE FOUR "POSITIONS" OF HEAD PRESENTATIONS.—By the term "*position*" as applied in the mechanism of labor, we mean the *positional relation existing between a given point on the presenting part, and certain other given points upon the pelvis.* In head presentations the *occiput* is the given point on the presenting part, and the given points on the pelvis are the *two acetabula*, and *the two sacro-iliac synchondroses.* Thus the *four positions* of a head presentation are:

1. Occiput to *left* acetabulum (left occipito-anterior).[1]
2. Occiput to *right* acetabulum (right occipito-anterior).
3. Occiput to *left* sacro-iliac synchondrosis (left occipito-posterior).
4. Occiput to *right* sacro-iliac synchondrosis (right occipito-posterior).

Very rarely the occiput points directly in front, to the symphysis pubis, or directly behind, to the sacral promontory, thus making *two* more positions (*six* in all). But these two may be left out. They usually become converted into one of the other four at the beginning of labor.

The order of greatest *frequency* of the four positions is as follows:

First. Occiput to *left* acetabulum, L. O. A.[2] [illegible]
Second. Occiput to *right* sacro-iliac synchondrosis, R. O. P.
Third. Occiput to *right* acetabulum, R. O. A.
Fourth. Occiput to *left* sacro-iliac synchondrosis, L. O. P.

This order of frequency is worth remembering, but to *call* the positions first, second, third, and fourth is worse than useless and had better be omitted.

(If the student is not already familiar with the terms and measurements given in describing the pelvis (Chap. I.) and fœtal head (Chap. II.), he should review them before attempting to learn the mechanism of labor. In the following description it is designed to give only the *main principles* of the mechanism, leaving exceptional occurrences and slight deviations and obliquities, of no great practical value, entirely out. A simple outline sketch had better be learned first. The finer tints and shades of variation can be put in afterward. (Mixture is confusion.)

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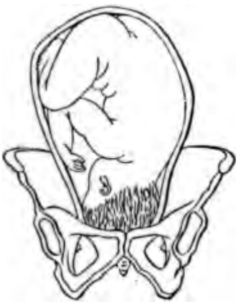
[1] So called because the occiput is pointing to the *left* and *forward.* The same plan of nomenclature is applied to the other positions.

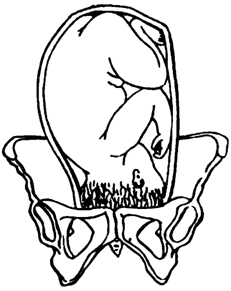
[2] L. O. A., Left Occipito-Anterior; L. O. P., Left Occipito-Posterior, etc.

Fig. 31.



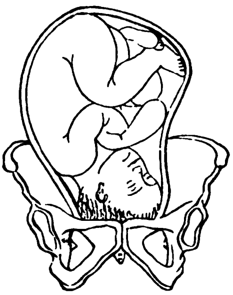
L.O.A.

Fig. 32.



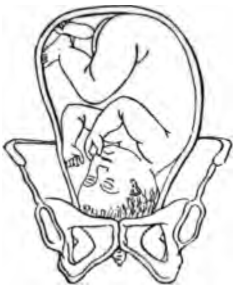
R.O.A.

Fig. 33.



R.O.P.

Fig. 34.



L.O.P.

Fig. 35.

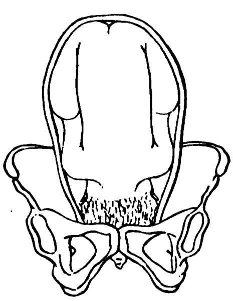
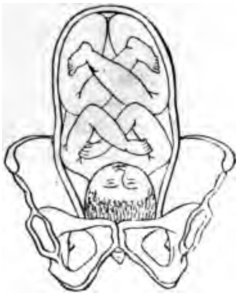


Fig. 36.



EXCEPTIONAL

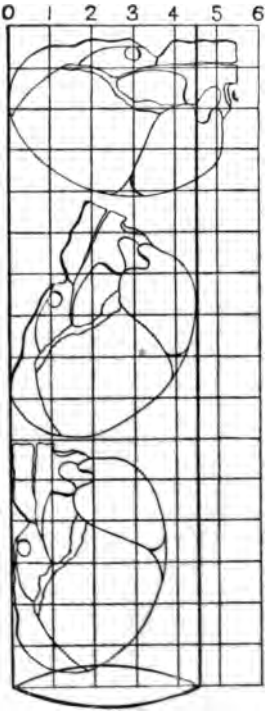
Figs. 31, 32, 33, 34, 35, and 36 represent the six positions of the occiput.

STAGES OF MECHANISM IN HEAD PRESENTATIONS.—These are: 1. Flexion; 2. Descent; 3. Rotation; 4. Extension; 5. Restitution or external rotation.

MECHANISM IN LEFT OCCIPITO-ANTERIOR POSITION (OCCIPUT TO LEFT ACETABULUM). 1. *Flexion.* It must be remembered the fœtal head is (roughly) egg-shaped, and measures from the *big* end of it to the *little* end (from the occiput to the chin (5½ inches). While the occipital pole of the head is at the left acetabulum, the chin-pole must be somewhere toward the right sacro-iliac synchondrosis, and a line drawn between these two pelvic points is one of the oblique diameters of the brim, and measures 4½ inches. Is a head diameter of 5½ inches, then, trying to pass a pelvic diameter of 4½? No; the bowed attitude of the child's head *in utero*, already mentioned, keeps its chin-pole tilted *up* toward the uterine cavity and the occipital pole tilted *down* toward the os uteri and pelvis, so that the forehead instead of the chin is really at the right sacro-iliac synchondrosis, and it is, therefore, the occipito-frontal diameter of the head (4½ inches in length) that is apparently trying to go through the oblique pelvic diameter of 4½. But this would be too tight a fit. The chin must be tilted yet more decidedly toward the sternum of the child, and the occiput be made to dip more decidedly toward the entrance of the pelvis, in order that the oval-shaped head may enter the brim more or less endways. This is *Flexion;* so called because the child's neck is *flexed*, and the chin pressed against the sternum. Fig. 37 (page 162) shows, diagrammatically, the effect of flexion in permitting descent. In the upper head, unflexed, it is seen the 5½ inch occipito-mental diameter cannot enter the 4½ inch diameter of the brim (represented by the ring at the lower part of the figure). The middle head is flexed sufficiently to descend. The lower head shows an impossible degree of flexion—impossible when the head is attached to the neck—and undesirable, as it would permit the head almost to drop through the pelvis. The lines and numerals represent inches.

What *causes* flexion? The force of uterine contraction is transmitted through the body of the child to its head by means of the spinal column, but the cervical end of the spine, where it joins the cranium, is *not in the centre* of the base of the skull, midway between the two poles, but is *nearer the* *occipital pole*; this last, therefore, bears the brunt of uterine force and is made to dip down lower than the other pole. Moreover, the two poles meeting equal resistance from the circle of the os uteri and pelvic brim, the resisting force exerted upon the chin or frontal pole will be more effective

FIG. 37.



Influence of flexion in permitting descent.

because it is acting on the end of a longer lever than that applied to the occiput, hence the chin and forehead are tilted upward.

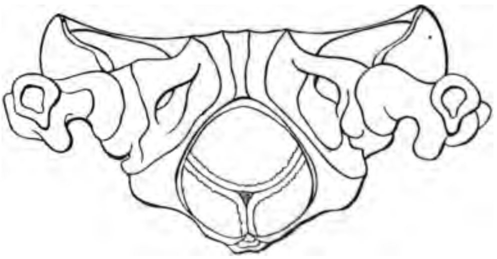
While the long (occipito-frontal) diameter of the head is more or less paralled with *one* oblique diameter of the pelvic brim, the transverse or biparietal diameter (3½ inches) occupies the *other* oblique (4½). Hence there is plenty of room for *that* to pass. The biparietal diameter is also *about* on a level with the *plane* of the superior strait, owing to the fundus uteri being so tilted forward as to bring the uterine axis in a line with the *axis* of the plane of the brim.

2. *Descent.*—The head having been tilted endways by flexon, it enters, occiput first, the pelvic brim, and *descends* into the pelvic cavity. It goes on down (the occiput still toward the left acetabulum and forehead toward the right sacro-iliac synchondrosis) until reaching the pelvic floor (the bottom of the basin).

(*Note.*—While flexion and descent are thus described as separate processes, and while the former is necessary to the latter, it must not be supposed that flexion is complete before descent begins; on the contrary they go on simultaneously, each increment of flexion being accompanied with an increment of descent.)

3. *Rotation.*—The head having descended to the pelvic floor, its occipito-frontal diameter (4½) *now* occupies the oblique diameter of the *inferior* strait, which, however, measures *only* *four inches.* It cannot go on. Something must occur to bring the long diameter of the head parallel with the *antero-posterior* diameter of the outlet, which we know measures 4½ inches, or even 5 when the coccyx is pushed back. This is accomplished by rotation. Near the end of its " descent " the occiput strikes the slanting surface of bone in front of the ischial spine—the

FIG. 38.

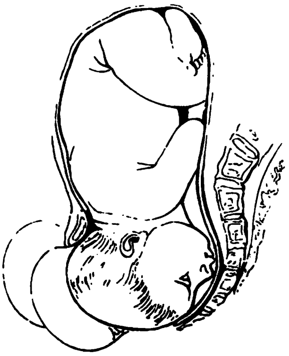


Occiput at inferior strait after rotation.

so-called left *anterior inclined plane*—and gliding downward, forward, and inward toward the median line, it reaches the symphysis pubis, while the forehead, rotating downward, *backward,* and inward toward the median line (along the right *posterior* inclined plane), reaches the centre of the sacrum. Thus the ovoid head has come to occupy a position agreeing with the longest (antero-posterior) diameter of the outlet, and the occipital pole is almost ready to escape, endways, through the inferior strait. (See Fig. 38, page 163.)

4. *Extension.*—The head now stretches the perineum and soft parts into a kind of gutter, which constitutes the fleshy continuation of the parturient canal. The occiput descends below the symphysis pubis and passes on between the pubic rami, until the biparietal equator of the head fits into the pubic arch. The back of the child's neck meanwhile fits squarely against the posterior surface of the pubic symphysis; and resting there immovably, the force of uterine contraction is expended upon the chin-pole of the head, hence, as soon as the resistance of the soft parts permits the occiput to begin to escape, the chin is released from its condition of flexion, and extension is said to have begun. Finally the forehead slips by the projecting coccyx, the parietal equator of the head emerges from the vaginal orifice, and the immediate retraction of the elastic perineum over, successively, forehead, nose, mouth, and chin, causes the occiput to rise up outside and in

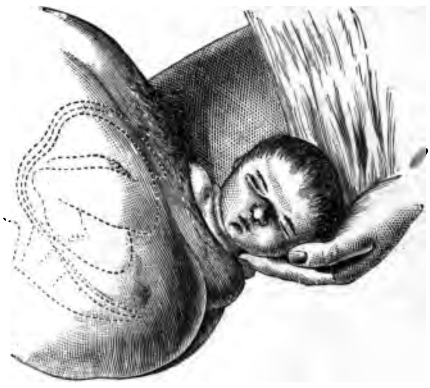
FIG 39.



front of the pubes toward the mons veneris. Thus delivery takes place by the head describing a circular movement round the fixed centre of the pubic arch—a movement exactly the reverse of flexion, viz., *extension*. (See Fig. 39, page 164. Remember the *direction* of extension in this L. O. A. position is such as to make the occipital pole go *upward* and *forward* toward the mons veneris. In the R. O. P. and L. O. P. positions, we shall see this is sometimes reversed.)

5. *Restitution* (External Rotation).—The head, after being completely born by extension, hangs out of the vagina; the chin dropping toward the anus, the vaginal orifice encircles the neck. The head next twists, or rotates, in such a manner as to bring its occiput toward the mother's left thigh—the thigh corresponding to the acetabulum at which it originally presented. The purpose of this manœuvre is to facilitate delivery of the shoulders. Their longest diameter is, of course, the bisacromial—from one acromion process to the other. This diameter entered the brim and descended into the cavity of the pelvis parallel with the oblique pelvic diameter extending from the right acetabulum to the left sacro-iliac synchondrosis. But having reached the *inferior* strait, the bisacromial diameter must rotate from its oblique direction in the pelvis to the antero-posterior one. Hence the

FIG. 40.



Restitution.

right shoulder glides along the right anterior inclined plane to the pubes; the left one, along the left posterior inclined plane to the sacrum. This rotation of the shoulders *inside* the pelvis, causes rotation of the head *outside* of it. The shoulder at the pubes usually fixes itself there, while the other one, at the perineum, swings round, describing a circular movement (as the occiput did), and comes out first. (See Fig. 40, page 165.)

When the shoulders are delivered, the rest of the body usually slips out at once, without any special mechanism.

MECHANISM OF R. O. A. POSITION—OCCIPUT TO RIGHT ACETABULUM.

1. *Flexion*, by which the chin tilts up, and the occiput down, so as to get the long diameter of the head more or less endways to the pelvic brim.
2. *Descent*, by which the head descends, occiput first, through the brim, into the cavity, down to the inclined planes of the pelvic floor.
3. *Rotation*, by which occiput glides along *right* anterior inclined plane, downward, forward, and inward to symphysis pubis; and forehead glides along *left* posterior inclined plane to middle of sacrum.
4. *Extension*, by which occiput escapes under pubic arch and rises up, outside, toward mons veneris, while forehead, nose, mouth, and chin successively escape at perineum.
5. *Restitution* (external rotation), by which occiput turns toward mother's *right* thigh (the thigh corresponding to acetabulum at which it originally presented), in consequence of shoulders rotating upon inclined planes—left shoulder to pubes, right to coccyx, the latter one generally escapes first. Delivery of the body.

Thus we have described the two *anterior* positions of the occiput: L. O. A. and R. O. A. Next come the two *posterior* ones.

MECHANISM OF R. O. P. POSITION (OCCIPUT TO RIGHT SACRO-ILIAC SYNCHONDROSIS):

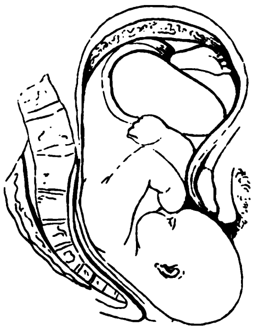
1. *Flexion*, and 2. *Descent*, as in anterior positions of the occiput.

3. *Rotation.*—In the large majority of cases (96 per cent.), the occiput rotates all the way round to the symphysis pubis. In doing so it passes the right acetabulum, but it no sooner reaches this point than it becomes practically, and in reality, a right *anterior* position, and the rest of the mechanism is *precisely* the same as already described for the R. O. A. position.

In the small minority of cases (four per cent.), the occiput, instead of rotating forward, *rotates backward* to the sacrum, and the forehead comes to the pubes.

Then follows, 4. *Extension*, which takes place, not upward toward the mons veneris, but the occiput escapes over the perineum, and is depressed outside of it downward, and backward toward the anus, while forehead, nose, mouth, and chin successively emerge under the pubic arch. (See Fig. 41.)

FIG. 41.



Extension after *posterior* rotation.

5. *Restitution.*—By internal rotation of the shoulders, as already explained, one goes to pubes, the other to sacrum, and the occiput rolls round to the right thigh (the thigh corresponding to the sacro-iliac synchondrosis at which it originally presented).

MECHANISM OF L. O. P. POSITION (OCCIPUT TO LEFT SACRO-ILIAC SYNCHONDROSIS):

1. *Flexion.* 2. *Descent.* 3. *Rotation*, in the majority of cases all the way round to the symphysis pubis (when, on reaching

left acetabulum, it, of course, becomes converted into an L. O. A. position); in the minority of cases, backward rotation of occiput to sacrum.

4. *Extension* of occiput downward and backward over perineum, while forehead, nose, and chin, successively escape under pubic arch. 5. *Restitution*, internally of shoulders, left one to pubes, right to coccyx; externally of occiput to left thigh (thigh corresponding to the sacro-iliac synchondrosis at which it originally presented).

EXPLANATION OF POSTERIOR ROTATION.—In those few cases of occipito-posterior positions where the occiput rotates to the sacrum, the circumstance is due to *imperfect flexion* of the head, so that the forehead is too low. In reality it is, therefore, anterior rotation of the forehead which causes posterior rotation of the occiput, in obedience to a general rule, that whichever pole of the head is lowest in the pelvis will rotate to the pubic symphysis. Occasionally, however, the forehead, being lowest, will stick near the acetabulum, and then rise again, permitting the occiput to descend along the opposite sacro-iliac synchondrosis, when anterior rotation of the occiput, all the way round to the pubes, will take place almost at the last moment.

Still another variation may occur when the occiput *has* rotated posteriorly, viz., instead of the occipital pole escaping over the margin of the perineum, the forehead, nose, and chin, successively, escape *first* under the pubic arch, when the chin rises up toward the mons veneris, and the occiput comes out *last* at the perineum. In fact, the case is converted into a face presentation, just before the head is born. This modification of the usual mechanism is exceptional.

DIAGNOSIS OF THE "POSITION" IN HEAD PRESENTATIONS.—In the L. O. A. and L. O. P. positions, the part of the head first touched by the examining finger is the right parietal bone; in the R. O. A. and R. O. P. positions, it is the left parietal bone. In either case it is that parietal bone which lies nearest the pubes. This is easily understood by remembering that the head enters the pelvis in a line with the long axis of the uterus, which agrees with the axis of the plane of the superior strait, while the finger enters the pelvis from below, and more in a line with the axis of the inferior strait, so that it necessarily touches the *side* of the presenting head. One parietal bone looks upward and backward, toward the sacral promontory, the other downward and forward, toward the pubes. The latter one is touched first. Then by pushing the finger a little higher up and further backward toward the sacrum, the sagittal suture, running between the two parietal bones, may be felt extending obliquely across the pelvis between the acetabulum and opposite sacro-iliac synchondrosis. If it is a L. O. A. position, the finger, by following the sagittal suture toward the left acetabulum, will there find the small triangular fontanelle at the junction of the sagittal and lambdoidal sutures. If it is a R. O. A. position, this fontanelle will be discovered by following the same suture toward the right acetabulum. If it is a R. O. P. position, following the sagittal suture toward the *left* acetabulum will *not* bring the finger to the *little* fontanelle. but to the large membranous anterior one. So in a L. O. P. position, the finger will find the large fontanelle at the *right* acetabulum, by following the sagittal suture in that direction. In the two posterior positions (last mentioned), the small triangular fontanelle cannot be touched at all—it is entirely out of reach.

In short, having felt the sagittal suture, follow it toward that acetabulum to which it points (it *must* point to one or the other), and there will be found the *posterior* fontanelle in *anterior* positions of the occiput (right or left as the case may be); or the *anterior* fontanelle in *posterior* positions of the occiput (either right or left).

Later in the labor, when rotation has taken place, the posterior triangular fontanelle, in anterior positions, will be felt toward the symphysis pubis, the sagittal suture running backward toward the sacrum; while in those posterior positions where anterior rotation of the occiput does not take place, the large membranous, unmistakable anterior fontanelle will be felt toward the pubic symphysis.

PROGNOSIS AND TREATMENT OF OCCIPITO-ANTERIOR POSITIONS.—Prognosis favorable in so far as the mechanism is concerned, and no assistance required in ordinary cases, other than general attentions already mentioned under "The Management of Labor."

PROGNOSIS AND TREATMENT OF OCCIPITO-POSTERIOR POSITIONS.—In the majority of cases the same as in anterior positions. In the minority of cases, where anterior rotation of the occiput fails to take place, a long and difficult labor may be anticipated, owing to the difficulty the occiput encounters in escaping over the perineum, on account of the posterior (sacral) wall of the pelvis being so much deeper than the anterior (pubic) one. Forceps may be required to complete delivery, the short straight ones being preferred. The perineum is enormously distended and requires additional care to prevent rupture.

Various expedients have been devised to promote anterior rotation of the occiput when it does not occur spontaneously. Thus, since we know posterior rotation is generally the result of *imperfect flexion*.(the forehead being too low, the occiput too high), we may strive to remedy the difficulty by *making* flexion perfect. This can be done (the accoucheur possessing requisite skill) by pressing two fingers of one hand upon the forehead during the pains so as to push it up, or at least keep it from coming lower, while the force of uterine contraction is then expended in depressing the occiput. A vectis may at the same time be applied over the occiput to assist in pulling it down. The object is to get the occiput so low that it will pass *below* the spine of the ischium to the anterior inclined plane and rotate *forward*, while the forehead is kept high enough to pass *above* the opposite ischial spine and rotate backward. Rotation forward may sometimes be accomplished with forceps, while making traction.

If the pelvis is large, and the operator's hand small, the latter may be passed in alongside of the head, and the occiput drawn obliquely downward and forward to the pubes. Another plan: Etherize to full anæsthesia. Pass a hand into vagina; grasp head, and steadily and gently push it up out of the pelvis, *above superior strait.* Then flex it, and rotate occiput forward. Hold it so until the pains, aided by pressure of other hand on abdomen, push it down again into pelvis, in its now occipito-anterior position. Forceps may be required to complete the delivery.

Posterior rotation of the occiput is especially likely to occur when the head is unusually *large.*

CHAPTER XIV.

FACE PRESENTATIONS.

In face presentations the child's head, instead of being flexed, is extended, so that the *chin* end of the occipito-mental diameter is tilted down toward the entrance of the pelvis, while the occipital end is pressed up toward the child's *back*, just as the chin was pressed toward the child's sternum in head presentations.

The only well-defined *cause* is excessive lateral obliquity of the uterus, so that, to illustrate, if the occiput were toward the left acetabulum in an ordinary head presentation and the fundus uteri were tilted much toward the right side, the direction of the force of uterine contraction would be such as to press the occipital pole of the occipito-mental diameter upon the left edge of the pelvic brim, where it would remain solidly fixed, and the uterine force would then operate upon the other (chin) end, and force it down into the pelvic cavity, and a face presentation would result.

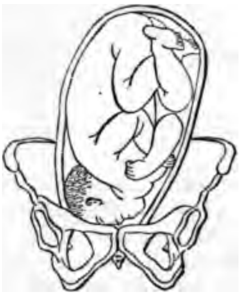
Positions of the Face Presentation.—The given point on the presenting part from which the positions of a face presentation are named, is the chin (Latin, "*mentum*").

The *number* of positions, like those of the occiput, is four, as follows:

1. Chin to left acetabulum (left mento-anterior), L. M. A.
2. Chin to right acetabulum (right mento-anterior), R. M. A.
3. Chin to right sacro-iliac synchondrosis (right mento-posterior), R. M. P.
4. Chin to left sacro-iliac synchondrosis (left mento-posterior), L. M. P.

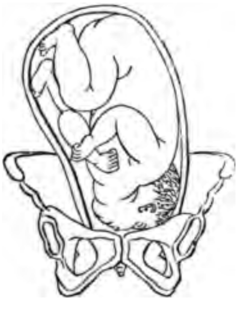
The directly antero-posterior positions of face presentations, as seen in Figs. 46 and 47, are so extremely rare as to be almost never met with in practice. They are, however, possible positions, and when they occur, are spontaneously converted into one of the other four positions (represented by Figs. 42, 43, 44, and 45) during the progress of labor.

Fig. 42.



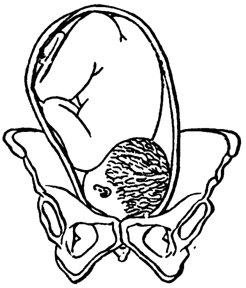
L.M.A.

Fig. 43.



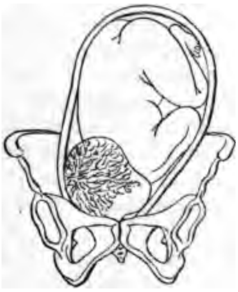
R.M.A.

Fig. 44.



R.M.P.

Fig. 45.



L.M.P.

Fig. 46.

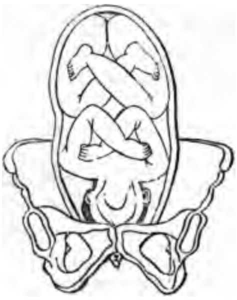
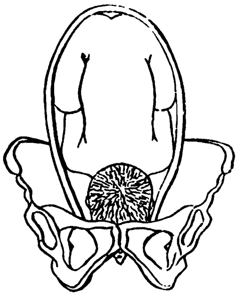


Fig. 47.

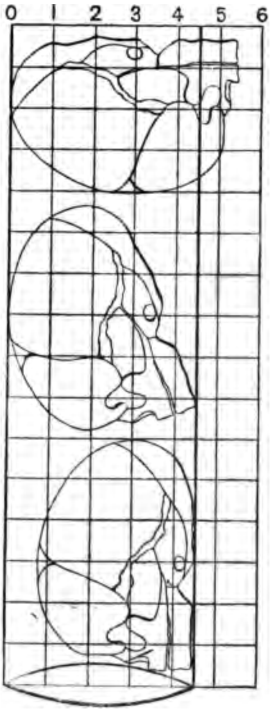


EXCEPTIONAL

Six positions of face presentation.

(*Note.*—The relative frequency of the several positions has not been positively ascertained, but the mento-posterior positions are more frequent than the mento-anterior ones. While the four *positions* of the face have been named according to the same plan adopted for the occiput, it may be stated that the chin is often *not exactly* at either acetabulum or sacro-iliac synchondrosis, but at some point between the two—*i. e.*, nearer the centre of the ilium, and hence the positions are called in some books, simply right and left *mento-iliac.* The *chin*, however, will arrive at the acetabulum or sacro-iliac synchondro-

FIG. 48.



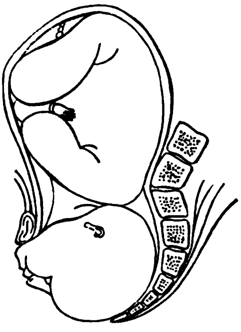
sis during the labor, and the plan we have adopted we think is best.

FREQUENCY OF FACE PRESENTATIONS.—They occur once in about 250 labors.

MECHANISM OF FACE CASES.—The whole matter is easily understood by remembering that the *chin* is the mechanical equivalent of the occiput, and follows the same mechanical movements as the occiput does in head presentations. The chin end of the egg-shaped head comes first. The several stages of the mechanism are: 1. Extension; 2. Descent; 3. Rotation; 4. Flexion; 5. Restitution (external rotation).

MECHANISM OF LEFT MENTO-ANTERIOR POSITION (CHIN TO LEFT ACETABULUM).—1. *Extension,* by which the occiput is tilted up and the chin down, so as to get the long (5½ inches) occipito-mental diameter more or less endways to the plane of the pelvic brim (see Fig. 48, p. 173). The diameter of the child's face that agrees with the oblique diameter of the pelvis in which it engages, is the fronto-mental—*i. e.*, the chin is toward the left acetabulum, the forehead toward the right sacro-iliac synchondrosis.

FIG. 49.



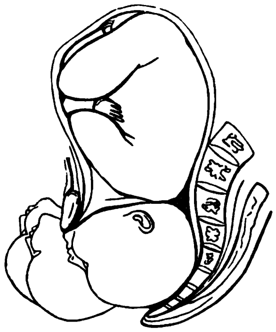
Anterior rotation of chin.

2. *Descent* (simultaneously, however, with extension), by which the head *descends,* chin first, through the brim, into the cavity, down to the inclined plane and pelvic floor.

3. *Rotation,* by which the chin glides along the left anterior inclined plane, at once downward, forward, and inward toward the median line, to the symphysis pubis; the forehead meanwhile glides along the right posterior inclined plane to the centre of the sacrum (see Fig. 49, page 174).

4. *Flexion,* by which the chin escapes under the pubic arch, and rises up outside toward the mons veneris, while the forehead, parietal protuberances, and occiput successively emerge at the perineum (see Fig. 50).

FIG. 50.



5. *Restitution,* by which the chin turns toward the mother's left thigh (the thigh corresponding to the acetabulum, at which it originally presented), in consequence of shoulders rotating upon the inclined planes—left shoulder to pubes, right to coccyx.

MECHANISM IN RIGHT MENTO-ANTERIOR POSITION (CHIN TO RIGHT ACETABULUM).—1. Extension; 2. Descent; 3. Rotation of chin, along right anterior inclined plane to symphysis pubis—of forehead along left posterior inclined plane to sacrum. 4. Flexion of chin upward, toward mons veneris, while occiput escapes at perineum. 5. Restitution, chin goes to right thigh (thigh corresponding to acetabulum, at which it originally presented), by reason of shoulders rotating—right shoulder to pubes, left to sacrum.

MECHANISM IN MENTO-POSTERIOR POSITIONS.—Before describing these, we may anticipate the same differences with regard to rotation and flexion as we found in head presentations with regard to rotation and extension; that is to say, in the great majority of cases, when the chin is directed posteriorly, it rotates all the way round to the symphysis pubis. In doing so, it of course passes the acetabulum, but it no sooner *reaches* the acetabulum that it is in reality an *anterior* position of the chin, and follows the same mechanism *exactly* as just described for mento-anterior positions. And, again, with regard to flexion when the chin is being born, it would, in mento-posterior positions, of course, be flexed *downward* over the perineum, instead of *upward* toward the mons veneris.

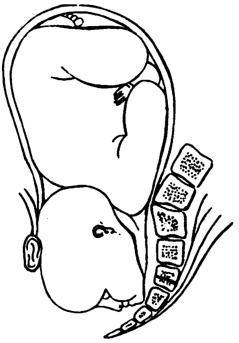
(*Note.*—It may here be anticipated, however, that such a mode of delivery in face presentations is, practically, a mechanical impossibility, as will be shown presently, and in which, therefore, the analogy between head and face presentations hitherto apparent, is wanting.)

MECHANISM IN LEFT MENTO-POSTERIOR POSITION (CHIN TO LEFT SACRO-ILIAC SYNCHONDROSIS).—1. Extension; 2. Descent; 3. Rotation, in the *majority* of cases all the way round to the symphysis pubis (when the labor will be finished, as in mento-anterior positions); in the *minority* of cases, rotation of the chin backward to the sacrum, *when the mechanism stops, and completion of delivery is mechanically impossible*, unless, indeed, the head is unusually small and the pelvis unusually large, when delivery would take place by backward flexion of the chin down over the perineum.

MECHANISM IN RIGHT MENTO-POSTERIOR POSITION (CHIN TO RIGHT SACRO-ILIAC SYNCHONDROSIS).—1. *Extension;* 2. *Descent;* 3. *Rotation*, in the majority of cases all the way round to the pubes (and delivery as for mento-anterior positions); in the majority of cases rotation of chin to sacrum, and consequent arrest of mechanism, further progress being impossible.

EXPLANATION OF ARREST, WHEN CHIN ROTATES TO SACRUM.—It is necessary for the chin end of the occipito-mental diameter *to escape over the edge of the perineum* before it can possibly execute the movement of downward flexion *outside* the perineum. Now, as we have seen, the depth of the *posterior* wall of the pelvis, from the sacral promontory to the tip of the coccyx is four and a half inches, while *the length of the anterior surface of the child's neck, from the sternum to the chin, is only about one inch and a half* (only just long enough to span the depth of the *anterior* pelvic wall at the pubic symphysis), hence, after posterior rotation of the chin, the child's sternum impinges upon the pelvic brim at the sacral promontory, or perhaps begins to descend a little below it, and there stops, so that the chin is thus arrested in the pelvis while it is yet a good distance higher up than the point of the coccyx, and the chin-pole of the occipito-mental diameter *cannot escape* over the perineal border to perform flexion. (See Fig. 51.)

FIG. 51.



Arrest of mechanism after posterior rotation of chin.

DIAGNOSIS OF FACE PRESENTATION.—The *side* of the face (at the beginning of labor) is the part first touched by the examining finger; that is to say: in a L. M. A. position, the left malar bone; in a R. M. A. position, the right malar bone; in a L. M. P. position, the left malar bone; and in a R. M. P. position, the right malar bone. In passing the finger higher up, and more backward, the nose may be felt, the openings of the nostrils indicating the direction of the mouth and *chin;*

while the orbits and forehead will be found in an opposite direction.

The face may be mistaken for a breech, owing to the swollen condition of the features (facies succedaneum) resembling the genital organs. Diagnosticate by feeling the mouth, which is a fissure bounded by the *hard gums* of the maxillary bones, while the anus (to be felt in breech cases) is a soft elastic ring.

PROGNOSIS OF FACE CASES.—Swelling and discoloration of the child's face frequently occur (of which notice should be given before birth), but they pass away in a few days.

The child may die, if delivery is long delayed, from cerebral congestion due to pressure of its neck and jugular veins against anterior pelvic wall.

Dangers to mother such as may occur from any tedious labor, especially when, in mento-posterior positions, anterior rotation of chin fails to take place.

Though spontaneous delivery is the rule, the mortality to both mother and child is somewhat greater than head presentations, and assistance is more frequently required.

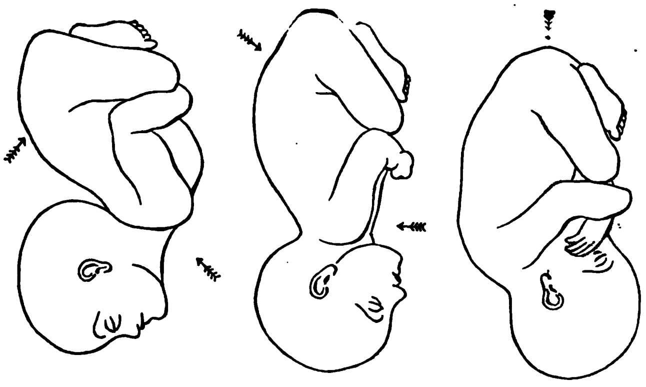
TREATMENT OF FACE CASES.—In mento-*anterior* positions, generally none, further than carefully watching the case for symptoms of "tedious labor" on the part of the mother, or of failure on the part of the child, when assistance may be rendered by forceps. Avoid rupturing membranes during examinations in early stage, and beware of injuring the eyes with the finger.

In mento-*posterior* positions, endeavor to secure anterior rotation of the chin when it fails to take place spontaneously. The several methods of attempting this, are: 1. Press the forehead backward and upward during a pain, so as to make extension more complete, and thus cause the chin to dip lower down and touch the anterior inclined plane, upon which it may glide forward. 2. Put a finger in the mouth, or on the outside of the lower jaw, and draw the chin forward during a pain. 3. Apply the straight forceps and twist the chin to the pubes. 4. Apply the vectis, or one blade of the forceps, *under* the most posterior cheek, and *over* the anterior inclined plane, thus, as it were, thickening the latter so as to make it reach the malar bone and constitute a *point d'appui* which the chin can touch and so glide forward.

Should all attempts to secure anterior rotation fail, the head, if not too deeply engaged in the pelvis, may be pushed back, and *version* tried; or, instead of this, an attempt may be made with the hand, vectis, or fillet, to bring down the occiput and convert the face into a head presentation. Failing in all these, the last resort is craniotomy.

In all cases of face presentation special care is necessary against rupture of the perineum. *Early* rectification of face presentation—its conversion into an occipital one—by *external manipulation,* has been lately recommended. It is available only when membranes are unbroken, abdominal walls relaxed, and operator skilful. Let one hand, over the abdomen, seize the anterior shoulder, and lift it, with the chest, upward and toward the child's back, while the other hand, near the fundus, presses the breech upward and toward the child's abdomen. When the body is thus lifted, the occiput will descend, or may be assisted so to do, by the hand of an assistant pressed upon it, low down, after which the breech is pushed *directly downward* and flexion rendered perfect.

FIG. 52.



The annexed illustrations, modified from Lusk's reproduction of Schatz's diagrams, explain the method more exactly. The arrows indicate the direction in which pressure is applied to the several parts, during successive steps of the operation.

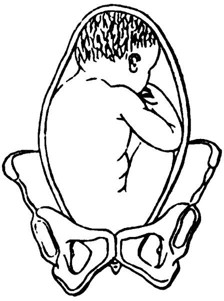
BROW PRESENTATIONS.— A rare presentation (of the "brow" or forehead) intermediate between a head and a face. It occurs in this way: face presentations are deviations from head presentations—that is, in face presentations the head originally presented, but the occiput catching on the side of the brim, lodged there, while the chin was forced down, constituting face presentation; but in this process of conversion of a head into a face, arrest may take place half-way between the two, when of course the forehead will be made to appear and stop at the centre of the superior strait: this is a brow presentation. The *diagnosis* may be made out by the position of the large anterior fontanelle and its radiating sutures, the prominence of the forehead, the orbits and parietal bones. *Treatment* consists in converting the "brow" into either a head or face presentation, by producing, respectively, complete flexion or complete extension, preferably the former, by pushing up the forehead, and bringing down the occiput. In many cases it takes place spontaneously. Delivery may be accomplished by forceps in some cases, even though the brow continue to present. Version by the feet has been recommended, when the diagnosis is made early (a very questionable practice); and in a few cases, where all other measures have failed, craniotomy may become a last resort, and should certainly be an *early* one, when the child is *dead*, for the mother's sake.

CHAPTER XV.

BREECH, KNEE, AND FOOT PRESENTATIONS.

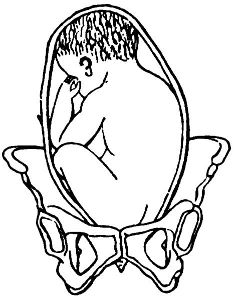
BREECH PRESENTATIONS.—These occur once in about fifty labors (two per cent.). The pelvic end of the fœtal ovoid presents, the lower limbs being flexed upon the abdomen, so that the buttocks first enter the pelvic brim. Usually, the legs are flexed upon the thighs, as shown in the Figs. 53 to 58; exceptionally they are extended at full length, so that the feet approach the face or point over the shoulders. (See Fig. 59, p. 182.)

FIG. 53.



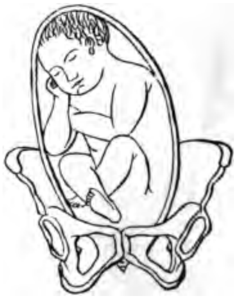
R.S.A.

FIG. 54.



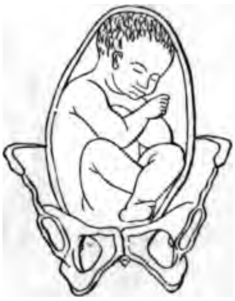
L.S.A.

FIG. 55.



L.S.P.

FIG. 56.



R.S.P.

FIG. 57.

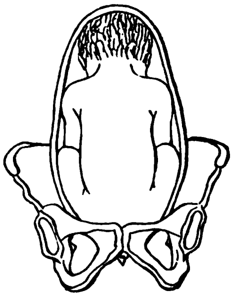
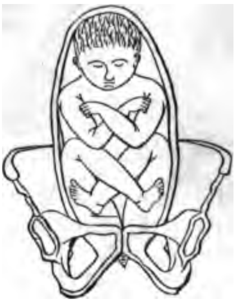


FIG. 58.



EXCEPTIONAL

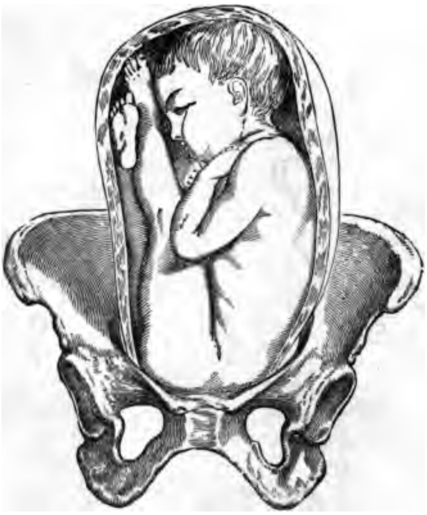
Figs. 53, 54, 55, 56, 57, and 58. Six positions of breech presentation.

POSITIONS OF A BREECH PRESENTATION.—Of these there are *four;* and the given point on the breech, from which they are named, is the child's *sacrum.* Exceptionally the child's sacrum may be directly in front or behind, really making six positions. Thus:

1. Sacrum to left acetabulum (left sacro-anterior), L. S. A.
2. Sacrum to right acetabulum (right sacro-anterior), R. S. A.
3. Sacrum to left sacro-iliac synchondrosis (left sacro-posterior), L. S. P.
4. Sacrum to right sacro-iliac synchondrosis (right-sacro-posterior, R. S. P.)

The two sacro-*anterior* positions are most frequent.

FIG. 59.



Breech presentation—legs extended.

MECHANISM OF BREECH CASES.—In complete delivery of the child there are here three successive stages to be considered, viz.:

1. Mechanism of the breech.
2. Mechanism of the shoulders.
3. Mechanism of the head.

Each of these may again be subdivided as follows:

a. Moulding,
b. Descent,
c. Rotation, and
d. Delivery *of the breech.*

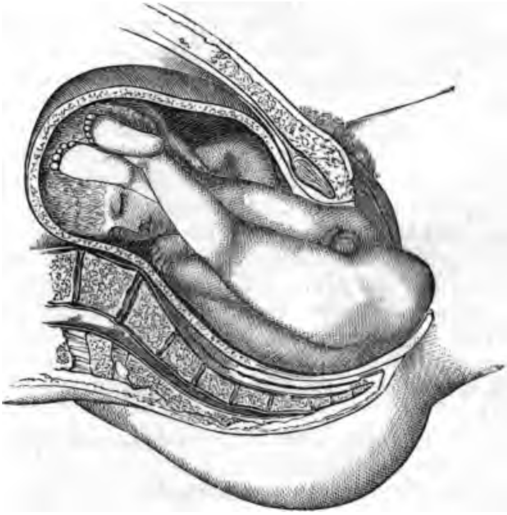
e. Descent,
f. Rotation, and

g. Delivery *of the shoulders.*

h. Flexion,
i. Descent,
j. Rotation, and
k. Delivery *of the head.*

MECHANISM IN LEFT SACRO-ANTERIOR POSITION (SACRUM TO LEFT ACETABULUM).—Here the longest diameter of the breech, viz., from one trochanter to the other, occupies that oblique diameter of the brim which extends from the *right* acetabulum to the *left* sacro-iliac synchondrosis. The sacrum of the child being directed toward the left acetabulum, its back, and, of course, the back of its head (occiput), are directed toward the left anterior part of the uterus, in a line

FIG. 60.



Rotation and delivery of hips. This figure represents the legs *extended*, which is unusual.

with the left acetabulum; hence, when the body is delivered, the *occiput of the after-coming head will also be directed to the left acetabulum.* As labor progresses there occur:

1. *Moulding* of the breech, by which it simply becomes gradually compressed ("moulded") into a circular shape, so that it may pass through the os uteri and pelvic brim.

2. *Descent*—the breech passing down the pelvic cavity to the pelvic floor.

3. *Rotation.*—The left hip (the hip nearest the pubes) glides along the right anterior inclined plane to the pubic symphysis; while the right hip (the hip nearest the sacrum) glides along the left posterior inclined plane to the sacrum. The long (bi-trochanteric) diameter of the breech, which entered the brim in the oblique pelvic diameter, has now, therefore, become parallel with the longest (antero-posterior) diameter of the inferior strait. (See Fig. 60, page 183.)

4. *Delivery* of the breech—the hip that is toward the pubes fixing itself against the arch, while the other one sweeps round the curve of the (maternal) sacrum and comes out first at the perineum.

(*Note.*—It should again be observed that *descent* necessarily occurs *simultaneously* with and during all the other stages. So the shoulders and head have, of course, been simultaneously descending with the breech. Descent is considered as a separate stage only in so far as it is a necessary preliminary of rotation—*i. e.*, the descending part *must come down* low enough to strike the *inclined planes* before rotation can occur.

Note further, that when the breech is extruded the child's body has necessarily become bent *on its side* conformably to the curve of the pelvic canal. Sometimes this is improperly set down as a separate stage of the mechanism, called "lateral flexion.")

To resume, the breech having been delivered, we have next to deal with the shoulders, thus:

5. *Descent.*—The longest (bisacromial) diameter entering the brim at the same oblique diameter as the bi-trochanteric diameter of the breech did, descends to the pelvic floor.

6. *Rotation.*—The shoulder nearest the pubes (left one) rotates to the pubes: the shoulder nearest the sacrum (right one) rotates to the sacrum (see Fig. 61, page 185), which brings the bis-acromial diameter antero-posterior at the inferior strait.

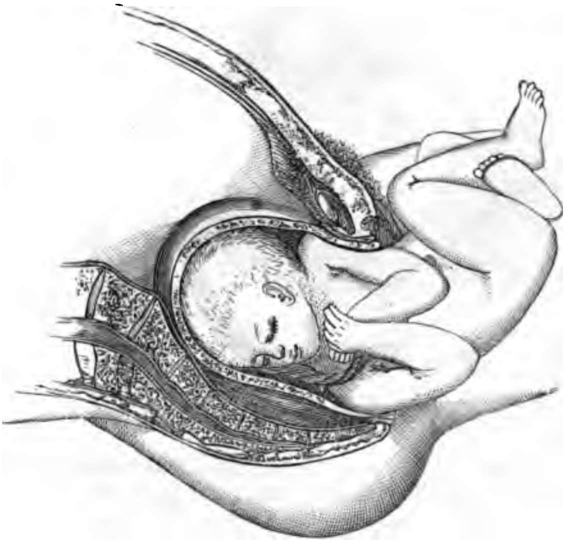
7. *Delivery of the Shoulders*—the one toward the pubes fix-

ing itself there, while the other one sweeps round the curve of the sacrum, and comes out first at the perineum.

The shoulders having been delivered, next comes the head, thus:

8. *Flexion*, by which the chin-pole of the occipito-mental diameter is made to dip down toward the child's sternum, while the occipital pole is tilted up toward the fundus uteri, thus placing the occipito-mental diameter more or less endways and parallel with the axis of the pelvis. The occiput is toward the left acetabulum and the forehead toward the right sacro-iliac synchondrosis; hence the occipito-frontal diameter occupies an oblique diameter at the brim.

FIG. 61.



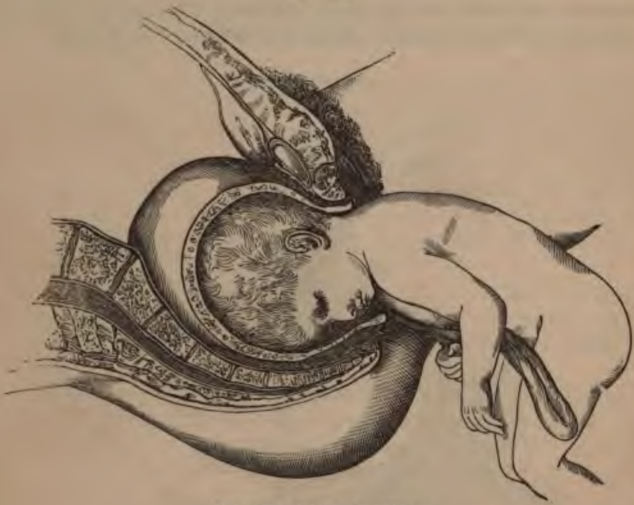
Rotation and delivery of shoulders.

9. *Descent* of the head into pelvic cavity, until occiput strikes left anterior inclined plane.

10. *Rotation*—of occiput to pubes—of forehead and face to hollow of sacrum, thus bringing longest engaging diameter of head antero-posterior at the outlet. (See Fig. 62, page 186.)

11. *Delivery of Head*—the occiput fixing itself *behind* the pubic *symphysis*, the back of the child's neck *under* the pubic *arch*, while chin escapes first at perineum, followed successively, by mouth, nose, forehead, biparietal equator, and last of all the occiput itself, which sweeps along curve of sacrum.

FIG. 62.



Anterior rotation of occiput.

MECHANISM IN RIGHT SACRO-ANTERIOR POSITION (SACRUM TO RIGHT ACETABULUM).—*Moulding*, *descent*, and *rotation* of the breech. The hip nearest the pubes rotating to the pubes, the one nearest the sacrum to the sacrum. *Delivery* of the breech. The hip nearest the sacrum coming out first at the perineum.

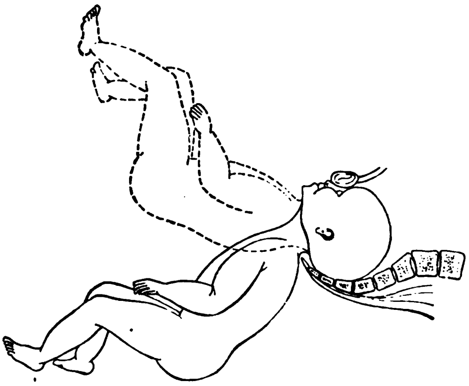
Descent and *rotation* of the shoulders—the shoulder nearest the pubes rotating to the pubes, the one nearest the sacrum to the sacrum. *Delivery* of the shoulders—the one at the sacrum coming out first over the perineum.

Flexion, *descent*, and *rotation* of the head—the occiput (now at the right acetabulum) rotating on the right anterior inclined plane to the pubes, the forehead to the sacrum. *Delivery of the Head:* chin, mouth, nose, forehead, biparietal equator, and lastly occiput, successively escaping over perineum.

MECHANISM IN LEFT SACRO-POSTERIOR POSITION (SACRUM TO LEFT SACRO-ILIAC SYNCHONDROSIS).—Moulding, descent, rotation, and delivery of the breech; and descent, rotation, and delivery of the shoulders exactly as already described for *anterior* positions of the sacrum.

Flexion and descent of the head are also the same, *except* that the occiput enters the pelvis directed toward the left sacro-iliac synchondrosis instead of toward one of the acetabula. Hence *rotation* of the occiput takes place, *in the majority of cases*, all the way round to the symphysis pubis, when the rest of the mechanism is the same as just described for *anterior* positions of the occiput. *In the minority of cases* the occiput rotates posteriorly into the hollow of the sacrum, the forehead to the pubes.

FIG. 63.

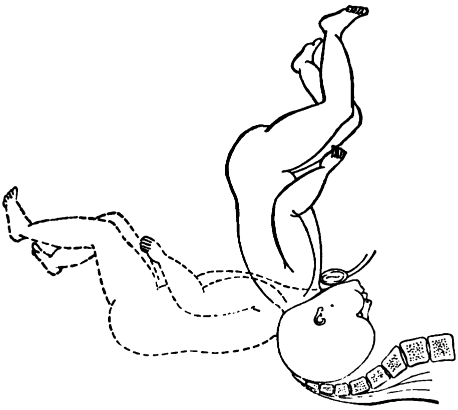


Posterior rotation of occiput and delivery by flexion.

Delivery of the head now takes place (most often) by *continued flexion*, the chin-pole of the occipito-mental diameter dips toward the child's sternum (*under* the pubic arch), while the occiput is tilted up posteriorly toward the sacral promontory. The nape of the child's neck rests on the perineum, while chin, mouth, nose, forehead, biparietal equator, and lastly occiput, successively escape *under* the pubic arch. (See Fig. 63, page 187.) The figure in *solid* lines shows the direction in which the body must be held.

Delivery of the head may also take place (but more rarely) by *continued extension.* Thus the chin-pole of the occipito-mental diameter, instead of being depressed *under* the pubic arch, points up *above* the pubic symphysis—in fact, toward the woman's bladder. The *anterior* surface of the child's neck is fixed against the *posterior* aspect of the symphysis pubis, while the occipital pole of the occipito-mental diameter is forced down along the hollow of the sacrum to the coccyx and escapes first at the perineum, followed successively by biparietal equator, forehead, nose, mouth, and, last of all, the chin itself. (See Fig. 64. The body to be held up toward the pubes.)

Fig. 64.



Posterior rotation of occiput and delivery by extension.

Mechanism in Right Sacro-posterior Position. (Sacrum to Right Sacro-iliac Synchondrosis).—The first parts of the labor are the same as just described for the *left* sacro-posterior position. When the breech and shoulders are delivered, the occiput is of course directed to the right sacro-iliac synchondrosis. In the majority of cases it rotates all the way round to the pubes and so becomes an anterior position. In the minority of cases it rotates to the sacrum and will then be delivered either by *continued flexion*, the *chin* escaping first under the pubic arch, or by *continued extension*, the *occiput* escaping first at the perineum, as just described for the L. S. P. position.

(*Note.*—Sometimes in sacro-*posterior* positions of the breech, the rotation which brings the anterior hip to the pubes *goes on further* so as to bring the child's *back* to the pubes, or the back comes to the pubes by continuation of the shoulder rotation. In this way the occiput is brought in front to the acetabulum before its descent to the pelvic floor. It has become occipito-anterior.)

MECHANISM OF KNEE AND FOOTLING CASES.—These do not require separate study. The feet and knees are small enough to pass through the pelvis without any special mechanism. The breech and other parts following them undergo the same movements as in original breech cases.

DIAGNOSIS OF THE BREECH.—The examining finger *first* touches the *side* of the anterior buttock (the one directed toward the pubes), and feels the trochanter covered by muscles, etc., which make it softer than the hard globe of a head presentation. The fissure between the nates, the genital organs, the anus, the probable presence of meconium (thick and undiluted with liquor amnii), the tip of the coccyx, and spinous processes of sacrum, are sufficiently characteristic. Scrotum in males sometimes swollen and œdematous, resembling polypus or tumor, but is less solid. Difficulty in early stage owing to height of presenting part. Bag of waters may be large or protrude as elongated sac. Beware of mistaking fœtal vulva for axilla; and fat fold of elbow for fissure of nates. Elbow has three bony projections (olecranon and two humeral condyles). Diagnosis from face (see face cases, p. 178).

DIAGNOSIS OF KNEE.—Chiefly by exclusion. By its large size; by the tibial spine and patella. From a shoulder, by the absence of ribs and intercostal spaces, etc.

DIAGNOSIS OF FOOT.—By the projecting heel. From a hand by the fingers being longer than the toes. The great toe is longer than the others—the thumb shorter than the fingers. The fingers can be easily separated; the toes cannot. The foot is placed at right angles to the leg; the hand is in a line with the arm. The foot is thicker and not so flat as the hand. Its inner border thicker than its outer one—not so the hand.

PROGNOSIS OF BREECH CASES.—Generally favorable to mother, though labor may be long; but dangerous to child. When body delivered and head retained, child dies from *suffocation* due to pressure on umbilical cord or to partial separation or compression of placenta. Danger greater in footling than breech case, because small feet do not dilate os uteri sufficiently to permit easy passage of after-coming head, hence delay longer after expulsion of body than occurs in breech cases. Liability to prolapse of funis. In cases where legs are extended along front of child, labor may be long and difficult. The limbs act like splints, preventing that *lateral* flexion of the body by which the latter is conformed to the curve of the axis of the pelvic canal.

TREATMENT OF BREECH CASES.—Do nothing until the birth of the breech.[1] Preserve membranes from rupture. Refrain from attempting to hasten matters by drawing down the feet. Delay during early stages of labor is *not dangerous*, but prepares the parts, by prolonged dilatation, for subsequent easy passage of after-coming head. Delay of latter *is fatal* to child.

When the breech is born, promote lateral flexion of body by pressure on perineum. When trunk is delivered receive, support, and wrap it in warm cloth. Gently pull down a loop of the cord and place it toward that part of the pelvis where it will be least liable to pressure, viz.: toward that sacro-iliac synchondrosis to which the child's abdomen is directed. Watch its pulsations: their increasing feebleness proclaims danger to child. Hold the body in such a manner as not to impede rotation of shoulders into antero-posterior diameter of outlet. When shoulders are born, direct back of child to pubic symphysis, thus promoting anterior rotation of occiput. During birth of head lift body toward mons veneris.

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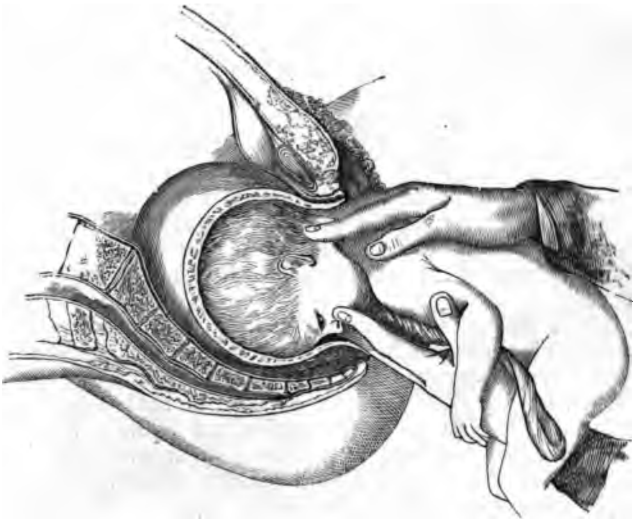
[1] **Prof. W. T. Lusk, however, in his recent work, recommends attempting cephalic version by external manipulation, early, before rupture of membranes, to avert subsequent danger to child.**

In the *rare* cases where *rapid spontaneous* delivery of the head follows extrusion of trunk no further active interference is necessary.

But *rapid spontaneous* delivery of after-coming head is exceptional. Delay is fatal; judicious assistance harmless. If the shoulders are not readily extruded, first one (that at perineum) and then the other must be drawn out by the finger hooked over the elbow or axilla—*elevating* the breech while withdrawing the *posterior* shoulder—*depressing* it toward the perineum while getting out the *pubic* one.

FIG. 65.



Extraction of head in breech cases.

The means for rapid delivery of head are: Ergot (by ergotin hypodermically if the case be urgent); manual pressure upon fundus uteri through the abdomen by a skilled assistant previously secured; urging the woman to bear down with all the voluntary effort she can command; and traction judiciously applied thus: support body in left hand, one or two fingers of which may be passed in along posterior vaginal wall to child's mouth, and its chin depressed toward its chest, while two fingers of the right hand are passed in under pubic arch and pressed upon the occiput so as to tilt it up and *assist flexion.* (See Fig. 65, page 191.) Thus, during traction, the chin-pole of occipito-mental diameter is made to escape over perineum and delivery follows. The finger (or two of them) of the left hand may also be passed into rectum and made to press through the recto-vaginal wall upon the forehead, thus again promoting *flexion.* Forceps may be used, but they are scarcely so efficient, or easy of application, as the combination of means above given.

Failing to deliver rapidly, by this or any other method, and weakness of umbilical pulse, with spasmodic contraction of child's respiratory muscles, indicating extreme danger, enable the child to breathe before birth by passing in two fingers between its face and vaginal wall, thus making a channel for air, to its mouth or nostrils. Flat tubes have been used for similar purpose.

In the "minority of cases" of sacro-*posterior* positions where anterior rotation of occiput has failed to occur, depress body toward perineum, pass one or two fingers under pubes to that temple, or side of the face directly anteriorly, and press it round toward the sacrum. Face cannot be forced round to sacrum by twisting body without danger to child's neck.

If the occiput still remain posterior, the head must be delivered by same means as already stated for anterior positions, noting *important* differences resulting from change of mechanism, viz.: the child's body must be held down toward perineum for chin to escape *under pubic arch,* where its "*continued flexion*" may be promoted by fingers of one hand, while those of the other tilt up occiput either per vaginam, or per rectum, as before indicated.

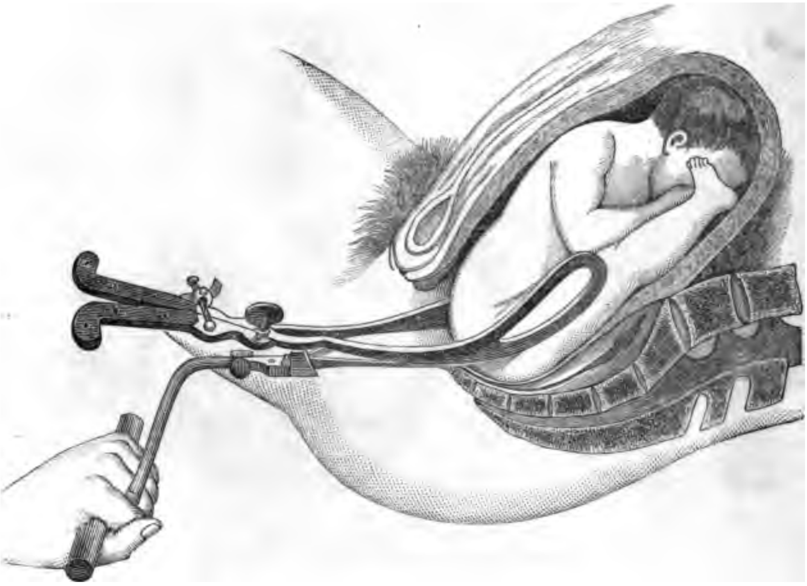
In those *most* rare instances of posterior rotation of occiput, where chin lodges *above* pubic symphysis (and cannot be gotten *below* it), the body must be *elevated toward mons veneris,* so that occiput may escape first at perineum by "*continued extension.*"

In all cases of breech presentation every means necessary for the restoration of suspended animation in the infant should be provided beforehand.

In cases of *unusual* delay during *early* stages, *accompanied with symptoms of exhaustion*, and due to a large breech, small pelvis, or some other abnormity, a finger, blunt-hook, or fillet may be passed over the groin and used for traction. If possible to reach a foot, it may be pulled down. Forceps and the vectis have been employed: their use is questionable. They may be tried, however, before embryotomy, which may, very rarely, become a last resort in bad cases of impaction.

Occasionally, owing to obliquity to the uterus, the breech, as it were, *sits on the edge of the pelvic brim*, instead of presenting over its centre. Progress is impossible. *Treatment:* Relieve by manual pressure over abdomen, or put a hand in the vagina and lift the breech off the side into the middle of the brim. Combine both manipulations.

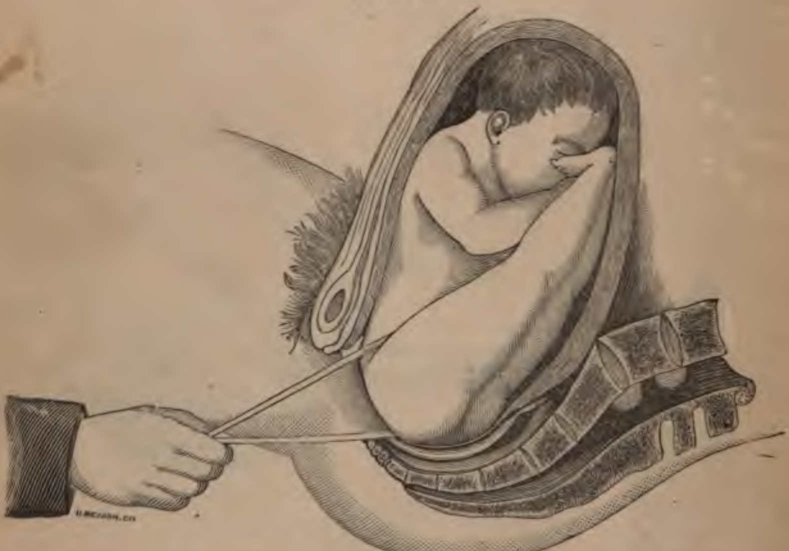
FIG. 66.



Tarnier's forceps applied to the thighs. (Ollivier, Lusk.)

Treatment when legs are extended.—These are exceptional cases and often occasion difficulty and danger. Should the diagnosis have been made early, before the breech has descended below brim of pelvis, and before the bag of waters has been discharged and the womb contracted round the child, cephalic *version*, by *external manipulation*, is best. This early diagnosis is difficult, and usually not attempted soon enough. It can scarcely be reached except my mapping out the child by palpation over abdomen. Failing to bring down head thus early, by external manipulation, the next expedient is to pass the hand inside, all *the way to fundus uteri*, and bring down the feet—a mode of proceeding, at best, difficult, and endangering rupture of uterus, especially after waters have been evacuated. When breech has descended into pelvic cavity, or become impacted, version should be abandoned. The expedients *now* at our disposal, named in order of preference, are:

FIG. 67.



The fillet in dorso-anterior positions. (Lusk.)

forceps, *fillet*, *blunt-hook*, and *cephalotribe*. Experience has amply demonstrated that forceps (made for the head) may be also safely applied to the breech when it has engaged in the pelvic cavity, and the os uteri is dilated. When hips have rotated (one to sacrum and one to pubis) one blade of forceps is applied to sacrum of child, the other to *posterior* surface of child's thighs. When hips have *not* rotated, but remain transverse, the blades are applied to the *lateral surface* of the *thighs* (see Fig. 66, page 193), not over the trochanters so that ends of blades impinge upon crests of ilia. Traction only during pains, slowly and without great force, assisted by pressure of hands of assistant over fundus uteri through abdomen. Should forceps fail or breech be too high up to admit of their application, and version be impracticable without using dangerous force, pass *fillet* over groin, in preference, round the thigh directed anteriorly, and make traction (see Fig. 67, page 194) until breech is low enough for forceps, or for fingers to be hooked in groin—the whole hand may be passed into vagina and be made to grasp breech bodily, a thumb in one groin and fingers over opposite trochanter. The *blunt-hook*, properly guarded, may be of service, passed over groin for traction. Its use requires skill and caution to prevent injury to child as well as mother. When child is dead, or other measures have failed, use *cephalotribe*, applying it tightly to breech, and extract during pains by judicious traction.

CHAPTER XVI.

TRANSVERSE PRESENTATIONS.

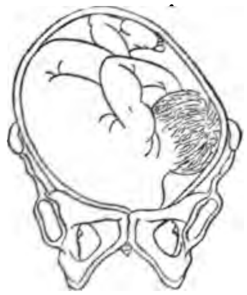
ANY presentation in which the child's body lies transversely *across* the pelvis, instead of *endways*, is a "transverse presentation;" hence presentations of the arm, shoulder, elbow, side, back, abdomen, etc., are all included in this class: Sometimes called "trunk" and "cross" presentations. They occur once in about two hundred and fifty labors.

For practical purposes it is only necessary to study *two* transverse presentations, viz.:

1. *Right* lateral presentation (including right arm, shoulder, elbow, hand, etc.).

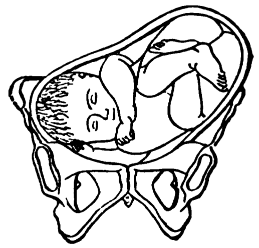
2. *Left* lateral presentation (including left arm, shoulder, etc.).

FIG. 68.



Left cephalo-iliac (or dorso-anterior) position of *right* shoulder.

FIG. 69.



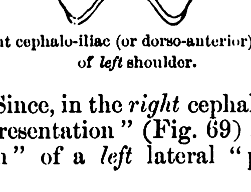
Right cephalo-iliac (or dorso-posterior) position of *right* shoulder.

Each of these two *presentations* has two "positions," viz.:

1. *Right* cephalo-iliac (the head, or "cephalic" end of the child resting upon the *right* ilium).

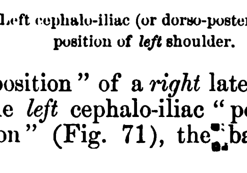
2. *Left* cephalo-iliac (the "cephalic" end of the child resting upon the *left* ilium).

FIG. 70.



Right cephalo-iliac (or dorso-anterior) position of *left* shoulder.

FIG. 71.



Left cephalo-iliac (or dorso-posterior) position of *left* shoulder.

Since, in the *right* cephalo-iliac "position" of a *right* lateral "presentation" (Fig. 69) and in the *left* cephalo-iliac "position" of a *left* lateral "presentation" (Fig. 71), the back (*dorsum*) of the child is directed toward the *posterior* wall of the pelvis, these two positions have also been called "*dorso-posterior*" ones; while the other two positions, in which the *dorsum* of the child is directed toward the pubes (Figs. 68 and 70, page 196), are called "*dorso-anterior.*"

Presentations of the *abdomen* and *back* are very rare, and soon become changed, *spontaneously*, into *lateral* presentations, or they *must* be so changed *artificially.*

MECHANISM OF TRANSVERSE PRESENTATIONS.—There is *no* mechanism; at least for *practical purposes*, it may be considered that natural delivery in cross presentations is *mechanically impossible.*

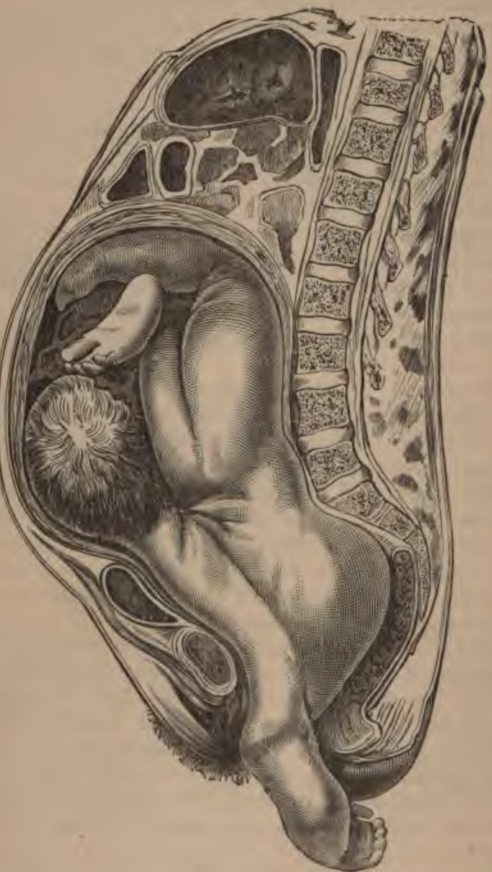
Actually, however (so wonderful are Nature's resources), there are *two* processes by which, in *exceptional* cases, delivery *may* occur spontaneously, but they are neither sufficiently safe nor frequent to be relied upon or waited for in practice. These are "*spontaneous version,*" and "*spontaneous evolution.*"

SPONTANEOUS VERSION.—That end of the fœtal ovoid nearest the pelvic brim (one end generally is so, for the child's body lies *obliquely* across the pelvis, seldom *exactly* transverse), under the influence of uterine contraction, gets lower and lower, and the other end higher and higher, until, finally, the lower end slips over the edge of the brim into the pelvic cavity, and the presentation has then become longitudinal, either a head or breech. This process is most apt to occur in multiparous women, with feeble uterine contraction, and *before* rupture of the membranes.

Another mode of spontaneous version occurs most frequently *after* rupture of the membranes in women with powerful contraction of the uterus. In this the os uteri is spasmodically contracted, so that while no downward progress of that end of the fœtal ovoid nearest the brim can take place (it, on the contrary, glides laterally and upward), that end of the child *nearest the fundus* is forced all the way down to the pelvic brim, and a head or breech presentation results.

SPONTANEOUS EVOLUTION.—The child's body remains crossways to the pelvic brim. The head rotates (*above* the brim) toward the nearest acetabulum, the breech toward the opposite sacro-iliac synchondrosis. The arm is extended from the vagina, the shoulder descends into the pelvic cavity, the neck rests behind the symphysis pubis. The body is then doubled laterally on itself, breech and head approaching each other (just as one might press together the two ends of a

FIG. 72.



Chiara's frozen section, representing spontaneous evolution sausage), while the rounded, convex angle of duplication is forced down through the pelvic cavity to the inferior strait. The side of the child (the side of its *chest*) is born first, followed by breech, legs, and feet, which are successively forced down along the sacrum and emerge at the perineum. Unless the pelvis is large, the child small, and uterine contraction strong, fœtal impaction is apt to occur, or the child is born dead from the prolonged and violent compression to which it has been subjected. See Fig. 72, page 198, representing a case as exhibited by frozen section of cadaver (after Barnes).

CAUSES OF TRANSVERSE PRESENTATION.—Prematurity of the labor. Placenta prævia. Narrowness of pelvic brim. Great lateral obliquity of the uterus. Multiple pregnancies. Undue mobility of the child from excess of liquor amnii. Accidental pressure externally from blows, falls, dress, etc. Repeated occurrence of cross-births in the same woman is probably due to a narrow pelvic brim.

DIAGNOSIS OF TRANSVERSE CASES.—By external palpation and inspection the womb is found to be unsymmetrical in shape, and longer transversely or obliquely than vertically. The two ends of the child's body may be felt above the brim, the cephalic end feeling harder and larger than the breech.

By vaginal examination, early in labor, the presenting part and os uteri are found high up and difficult to reach. The bag of waters is elongated in shape, sometimes projecting through the os like a glove-finger. The globe of the head is missing. Vaginal examinations should be made *between* the pains to avoid rupture of membranes.

DIAGNOSIS OF SHOULDER PRESENTATION.—By its rounded prominence; the sharp border of its acromion process; the clavicle; the spine of the scapula; the hollow of the axilla; and, especially, by proximity of *ribs and intercostal spaces.*

DIAGNOSIS OF ONE SHOULDER FROM THE OTHER WHEN THE HAND AND ARM ARE NOT TANGIBLE.—1st. Observe the opening of the axilla; it always points toward the child's feet. If the feet are, therefore, toward the *right* side of the pelvis, the *head* will be toward the *left* side.

2d. The scapula, its spinous process especially, will indicate whether the child's back is toward the pubes or toward the sacral promontory.

3d. A moment's reflection will show that a child lying across the pelvis (let the reader imagine *himself* to be lying across it), with its *head* in the *right* iliac fossa, and its *back* to the *pubes*, *must* be presenting its *left* shoulder to the pelvic brim—the " position " of the " presentation " being, necessarily, right cephalo-iliac (dorso-anterior). If the axillary opening shows the head to be in the *left* iliac fossa, and the position of the scapula shows the child's back to be toward the mother's sacrum, it will still be the left shoulder presenting, the *position*, however, being left cephalo-iliac (or dorso-posterior).

The same data and deduction may be used for the right shoulder and its two " positions."

DIAGNOSIS OF ONE SHOULDER FROM THE OTHER WHEN THE ARM IS IN THE VAGINA.—Grasp the child's hand as in ordinary hand-shaking. When the palm of the hand of the practitioner and the palm of the child's hand are brought flat against each other, if the *thumbs of the two hands come together*, the hand of the child will be right or left according as the physician is using his right or left.

Again, if the infant's hand is at the vulva, and its palm be turned up toward the symphysis pubis, the thumb will point toward the right thigh if it is the right hand, and to the left thigh if it is the left.

DIAGNOSIS OF THE " POSITION " OF THE " PRESENTATION " BY THE PRESENTING HAND.—*Extend* the arm, and place the hand *supine*. The thumb will then always point toward the head, and the face of the palm will agree with the surface of the child's abdomen.

DIAGNOSIS OF THE ELBOW.—By its three bony projections —the two condyles of the humerus and the olecranon process of the ulna. The *end* of the elbow, like the axillary opening, points toward the child's feet.

PROGNOSIS OF TRANSVERSE CASES.—Always serious. Often fatal to the child, sometimes to the mother. Much depends upon the presentation being corrected early, and upon the skill of the operator.

TREATMENT.—Early correction of the presentation—converting it into a head, breech, or footling—by the operation of version or turning. This may be done either by *external* manipulation; *internal* manipulation; or by a combined modification of both methods, known as *bipolar* version.

(*Note.*—Version, and the several modes of performing it, will be considered in the next chapter.)

CHAPTER XVII.

VERSION OR TURNING.

VERSION is an operation by which some part of the child other than that originally presenting is brought to the superior strait. When the *head* is brought down, it is "cephalic" version; when the *feet*, "podalic."

The cases in which it may be required are: transverse presentations; certain cases of moderately contracted pelvis; and in cases where accidental circumstances render rapid delivery necessary, such as placenta prævia, rupture of the uterus, prolapsus of funis, convulsions, "tedious labor,"[1] etc., provided delivery by forceps is not safe or practicable.

CHOICE BETWEEN CEPHALIC AND PODALIC VERSION.—When correction of a malpresentation is *all* that is required, and circumstances do *not* render subsequent immediate delivery necessary, perform cephalic version. When rapid delivery *is* necessary, podalic—bring down feet, that traction may be made and delivery completed at once.

METHODS OF OPERATING.—Each of the two operations, (1) *cephalic* and (2) *podalic* version, may be performed in three ways: 1. By external manipulation. 2. By combined external and internal manipulations. 3. By internal manipulation.

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[1] "Tedious labor" is not defined by length of *time*, but by *symptoms* of a special character, to be noted hereafter. (See Chapter XXVIII.)

VERSION BY EXTERNAL MANIPULATION.—Chiefly employed for correcting transverse presentations, either before labor begins; or, labor having begun, before the waters have been discharged; or as soon thereafter as possible, while the child is easily movable.

Operation.—Having previously made out the exact position of the child, place the woman on her back, with the thighs flexed, uncover the abdomen, then, with the flat hands—one on the child's head, the other on its breech—gently push the head toward the pelvic brim and the breech up toward the fundus uteri. During a pain, stop manipulating, holding the child just firmly enough to retain any degree of change in its position already gained. Pressure in the intervals. When the child slips round into its right position, rupture the membranes (if labor has begun) that the womb may contract and keep it there. If labor has *not* begun, place two pads—one on the side of the uterus high up against the breech, the other on the opposite side lower down, against the head—and retain them with binder. Instead of pushing down the *head* (cephalic version), the *breech*, if there is any coexisting necessity for rapid delivery, may be brought down, and the feet drawn out *per vaginam* (podalic).

VERSION BY COMBINED MANIPULATION.—When version by external manipulation is necessarily impossible, or has failed after trial, the second least dangerous method, by combined manipulation, should be tried. This consists of manipulating outside with *one* hand, while the other is passed into the *vagina*, two or three of its *fingers only* going into the *uterus*. The hand outside pushes down the part it is desired to bring to the superior strait, while the fingers inside simultaneously move the part at the os out of the way and upward along the opposite side of the pelvis. Thus, in *head presentations*, when it is desired to bring down the feet, the operation comprises three steps:

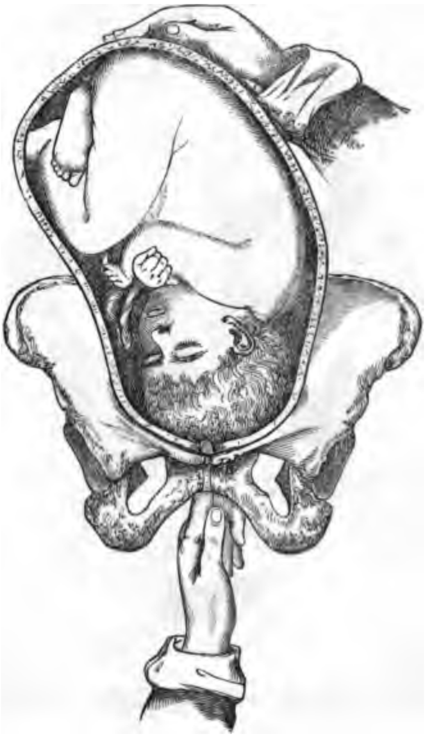
1. The fingers inside lift the head toward that iliac fossa toward which the occiput points, while the hand outside depresses the breech along the opposite side of the womb (Fig. 73, page 203). This having been done—

2. The fingers inside can now touch the shoulder, and they push or lift it in the same direction as the head, while the hand outside still further depresses the breech (Fig. 74, page

204). The head is now a little higher above the brim than the breech, and the knee is within reach of the fingers.

3. Grasp the knee (the membranes, if unbroken, may be ruptured), and pull it down, while the hand outside *changes*

FIG. 73.

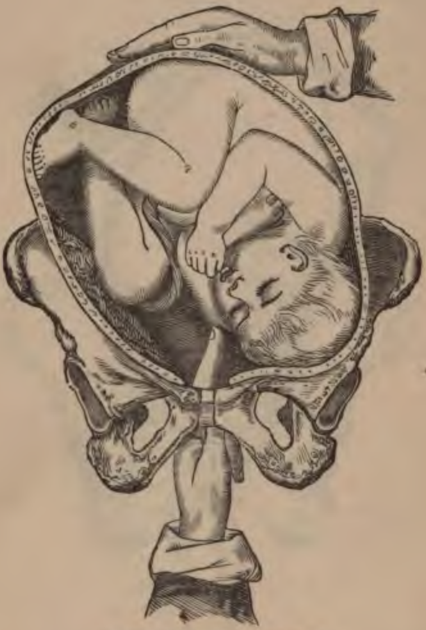


Bipolar version (first step).

its position so as to *push up the head* toward the fundus (Fig. 75, page 205). The foot may now be reached and the case managed as a breech or footling presentation.

In *transverse presentations* the operation comprises the second and third steps above given for head cases—that is, push the shoulder after the head, then grasp the knee, etc. Should it be desired, however, to convert the shoulder (transverse) presentation into a *head* presentation instead of a footling, the fingers inside will, of course, push the shoulder in the direction of, and *after the breech*, while the hand outside *depresses the head*.

FIG. 74.

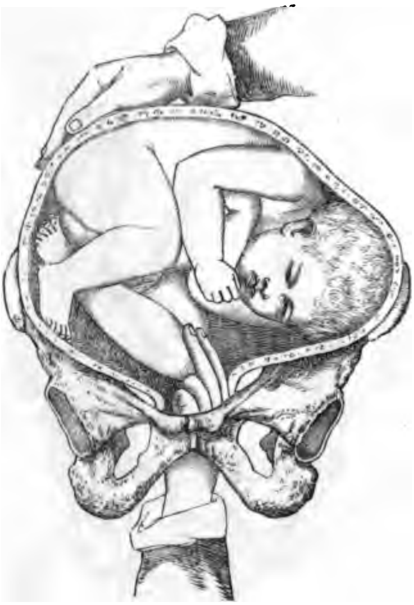


Bipolar version (second step).

It should be particularly observed that the *main purpose* of this combined or "bipolar" method, is to supersede the more dangerous proceeding of introducing the whole hand and part of the forearm into the uterus, which is the last alternative when the external and bipolar methods have been unsuccessful.

VERSION BY INTERNAL MANIPULATION.—Like all the version operations, this is comparatively easy before the waters have escaped and when the uterus is not rigidly contracted round the child, but difficult when opposite conditions prevail. Additional conditions, however, are necessary before the operation should be attempted, viz., the pelvis must be of sufficient size to admit the hand; the os uteri must be dilated or dilatable; the head (if it present) must not have passed through the os uteri, and the presenting part (whatever it may be) must not have descended so low, or become so firmly impacted in the pelvis that it cannot be pushed back above the superior strait without risk of lacerating the utero-vaginal junction or other soft parts.

FIG. 75.



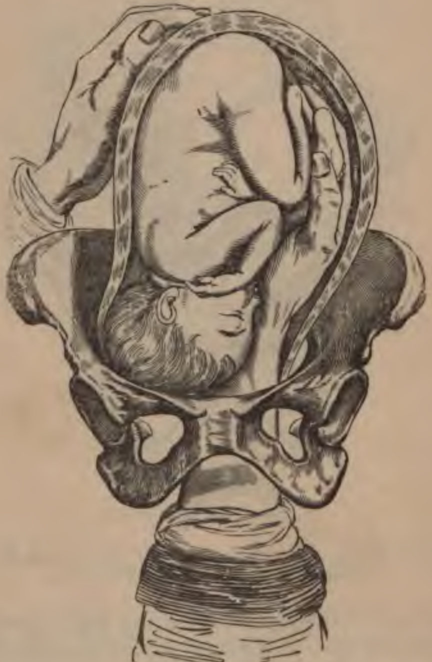
Bipolar version (third step). The external hand, as shown in the figure, has not yet changed its position, but is ready to do so.

INTERNAL VERSION IN HEAD PRESENTATIONS.—The operation comprises three steps:

1. Introduce the hand and grasp the feet.
2. Turn the child.
3. Extract the child.

The first *two* steps are to be proceeded with, only *between* the pains; the *third* step, only *during* the pains. When a pain comes on during the first two parts of the operation, hold the hand still, relaxed, and flat, and thus avoid risk of rupturing uterine wall with the knuckles.

FIG. 76.



Podalic version, grasping the feet.

Operation.—The woman is placed on her back, the hips brought to the edge of the bed, the legs properly supported; the operator *sits* between them on a low seat. If the womb is firmly contracted and waters discharged, *complete* anæsthesia is required.

Bare the arm to above the elbow, and anoint it with vaseline or lard, etc., on all parts except the hand's palm. Use the hand whose palm corresponds to the abdomen of the child, viz., in the L. O. A. and L. O. P. positions, the left hand; in the R. O. A. and R. O. P. positions, the right hand.

The finger-ends are brought to a cone over the end of the thumb, and the hand introduced into the vagina (with a slight rotatory movement, if necessary) in the axis of the pelvic outlet, its back toward the sacrum. The finger-ends and hand are then passed on into the os uteri, the elbow being depressed toward the perineum so as to bring the hand in line with the axis of the brim, while the other hand rests outside, making support and counter-pressure upon the fundus.

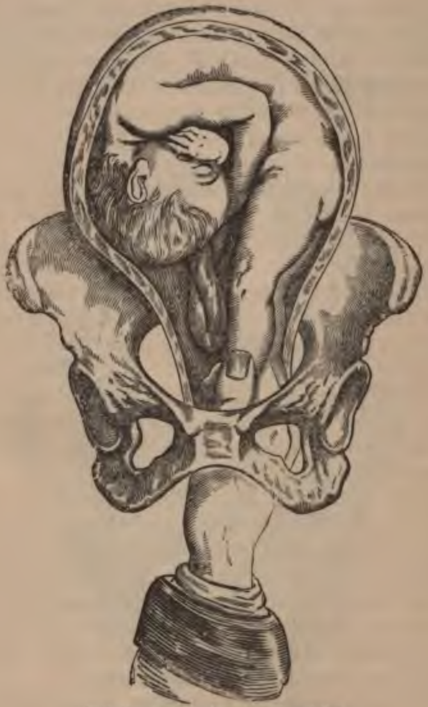
With the thumb between the head and pubes, and the four fingers between the head and sacrum, the head is grasped and lifted out of the way, "on the shelf" of that iliac fossa toward which the occiput points. The wrist resting against the forehead keeps it there, while the hand goes on up to grasp the feet, the other hand continuously supporting the fundus (see Fig. 76, page 206).

The feet (one, or both if possible) are then drawn down, while the other hand depresses the breech, which begins the *second* step, or *turning* the child (see Fig. 77, page 208). As it gets partly round, the hand outside may change its position to push up the head. The latter having reached the fundus, turning is accomplished, and (3d) *extraction* (*during* the pains) may be completed, following the mechanism and mode of delivery already described for breech cases.

Should the membranes be unbroken at the beginning of the operation, they should be ruptured when the hand passes by the head into the uterus, the wrist acting as a plug in the os to prevent escape of waters, or, the hand may be passed up *between* the unbroken membranes and uterine wall, the bag being ruptured when the feet are felt. This latter method is objectionable, from risk of loosening placenta, unless the operator is skilful.

VERSION BY INTERNAL MANIPULATION IN TRANSVERSE PRESENTATIONS.—This proceeding comprises the same three steps as just described for head cases, and the same general rules of operating, with modifications now to be noted. In selecting the hand (the woman lying upon her back), use the right hand when the right side (shoulder, etc.) presents, and the left for the left side.

FIG. 77.



Podalic version, turning the child.

WHERE TO FIND THE FEET.—In the *right* lateral "presentation," when the "position" is dorso-*anterior* (*left* cephalo-iliac), it is evident the feet will be found toward the *right* and *posterior* part of the womb, above the *right sacro-iliac synchondrosis,* hence easily reached by passing the right hand along the hollow of the sacrum, to the *right* of its promontory, and then higher, toward the posterior part of the *right* iliac fossa.

In the dorso-*posterior* (*right* cephalo-iliac) " position," of this same right lateral " presentation," the feet will rest toward the *left* and anterior part of the uterus above the *left* acetabulum. The right hand, therefore, should be passed along the sacrum as before, but to the *left* side of its promontory, and then higher up toward the posterior part of the *left* iliac fossa (where it feels the back of the child's breech), and must then be *pronated round the breech,* over the thighs, toward the anterior part of the *left* iliac fossa, where the feet will be found.

The same rules apply to the use of the *left* hand in the two " positions " of a *left* lateral " presentation."

There is another mode of reaching the feet in the two *dorso-posterior* positions, viz., by passing the hand directly up to the feet behind the pubes and acetabulum, instead of going behind the child's breech and pronating round it. This method is made easier by placing the woman on her *side* (the side toward which the feet are directed), while the operator standing behind her, passes the hand (right one for right lateral " presentation, and left one for left, as before stated), with its *back* toward the *pubes* and acetabulum, directly to the feet.

In transverse presentations, when the child has been *turned,* the case may be left to nature, unless circumstances render rapid delivery necessary, when the *third* step of *extraction* may be performed. If it is to be left alone, only *one* foot should be brought down, so that the buttock of the other side may add to the size of the breech and produce adequate dilatation of the os, so as to permit easy passage of the after-coming head.

Cephalic version by *internal* manipulation is not performed nowadays owing to difficulty of grasping the globular head, and for other reasons, though it was preferred to podalic in former times.

PROLAPSE OF THE ARM.—A tape may be put upon the arm by which an assistant holds it extended in the vagina, while the operator's hand passes in to perform *internal* version; but it must not be held by the tape so tightly as to interfere with its upward recession when the feet are being drawn down. In performing *bipolar* version the arm may sometimes be used to advantage in *pushing the shoulder* in the direction of the head, as before explained.

DIFFICULTIES OF VERSION.—The external and combined methods of version, when they can be accomplished at all, are done with comparative ease, and only in the more favorable cases. They would scarcely be attempted and seldom succeed, in the more difficult cases now to be considered, and in which even internal version is anything but easy.

The most common difficulty is long evacuation of the waters and *rigid contraction of the uterus* around the child. The manipulations increase uterine spasm still more; the operator's arm becomes cramped and useless from pressure; the child will not turn; and there is great risk of uterine rupture if violence be employed. *Treatment: Complete* anæsthesia to relax the womb, and steady, gentle, persevering efforts on the part of the operator.

Even when the foot has been drawn down to the os uteri, the shoulder (or head, as the case may be) will not recede, and turning seems impossible. *Treatment:* Fasten a tape to the foot, of sufficient length to be held outside the vulva, on which traction may be made, while the hand inside pushes the head (or shoulder) in the proper direction. In shoulder cases further assistance may be rendered by *external* upward pressure of the head. The internal repression must be made with *extreme caution* to avoid laceration, etc. Should all efforts fail, embryotomy becomes the only resort.

After turning, *extraction* may be difficult. Traction should be made slowly when soft parts are not yet dilated. It is unnecessary to attempt to aid rotation—the leg that is down will spontaneously come to the pubes. When hips begin to emerge, elevate leg, or legs, toward pubes, that the posterior hip may escape first at perineum. The hips and abdomen having been delivered, the arms may fail to descend, from having slipped up alongside of head. To remedy this: continue traction during pains, and carry the body toward pubes, till finger can reach the arm that is toward the mother's sacrum. Pass finger to inner side of humerus, slip it down to bend of elbow, then press forearm against face, and down over chest and abdomen until arm and forearm get alongside of and parallel with side of child's body. After posterior shoulder is delivered at perineum, depress body toward perineum, and hook down pubic arm in same manner. Should this method fail, the arm to be delivered may be brought in front of child's face and body, by grasping the latter with both hands and rotating it (one-eighth of a circle) so as to twist it away from the imprisoned arm which will not follow the rotation of the body, but is thus thrown across the chest, from whence it may be drawn down by a finger in the bend of elbow as before. The shoulders having been extracted, the after-coming head may be delivered as in original breech presentations. (See Chapter XV., page 191.)

CHAPTER XVIII.

INSTRUMENTS, FORCEPS, ETC.

OBSTETRICAL instruments are of two kinds: (1) Those designed to deliver the child without injury, sometimes called "blunt" instruments; and (2) those the use of which involves mutilation and destruction of the infant, hence called "cutting" instruments. Some of them, however, mutilate without cutting.[1]

BLUNT INSTRUMENTS.—These are the fillet, blunt-hook, vectis, and forceps, with some other contrivances not in general use.

The *fillet* is a noose of cotton, silk, or leather tape, or an uncut skein of worsted, used for traction. The loop having been passed around the part to which it is to be applied, the other end of the fillet is put through the noose and drawn to form a slip-knot. The whalebone fillet consists of a long slip of this material, the ends of which are bent toward each other and joined in a solid handle.

The fillet is seldom used by modern obstetricians except for the occasional assistance it may render in certain arm and breech cases already mentioned.

The *blunt-hook* is a cylindrical rod of steel, one end of which is attached to a wooden handle, and the other bent to form a hook, in the end of which is an "eye" through which a fillet may be threaded. It is used as a sort of long artificial finger for passing the fillet and making traction; is but little employed for delivery of living children on account of injury it is apt to produce; but becomes of great service in the extraction of dead ones during embryotomy operations.

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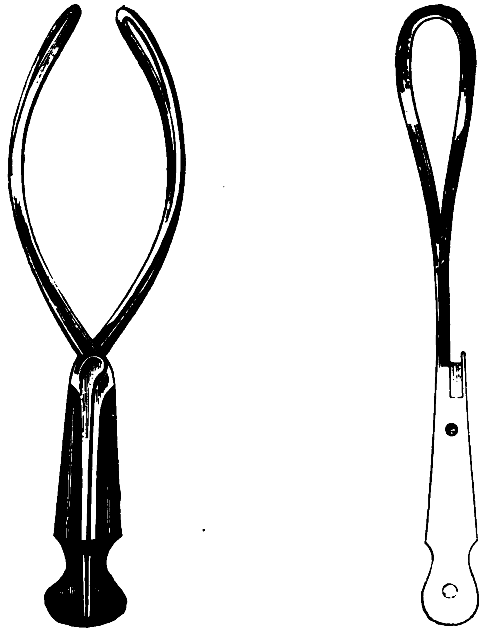
[1] The instruments used for Cæsarean section and other cutting operations upon the *mother*, are those ordinarily employed by *surgeons*, and are not, strictly speaking, obstetrical instruments.

Fig. 78.

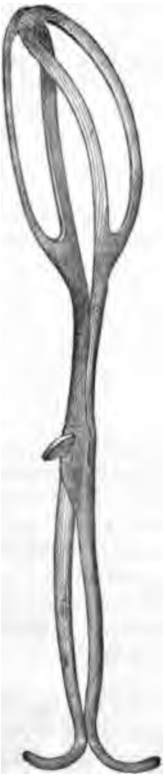


Short forceps (Denman's).

The *vectis* is a flattened steel blade with a fenestra, shank, and handle, resembling a single blade of the straight forceps, and curved to fit the contour of the fœtal cranium. Is seldom used, but may be of service, as a sort of artificial hand, in promoting flexion, rotation, and extension, when necessary in the mechanism of labor. As a tractor, it has become obsolete since the invention of forceps.

The *forceps* is a sort of pincers whose blades, like a pair of artificial hands, grasp the head and draw it through the pelvic canal.

FIG. 79.



Long forceps (Hodge's).

The instrument is composed of the *blades* proper (which grasp the head), the *lock* (where the two halves of the instrument cross each other and are "locked" together,) the *shank* (placed between the lock and blades to give length to the contrivance), and the *handles* (which are held by the operator). The two halves of the instrument are separately known as the "right" and "left" blades, called also "upper" and "lower," and "male" and "female" blades.

Forceps are either "short" or "long." The *short forceps*, called also "straight," have only one curve—the *cranial* curve, which adapts them to fit the cranium. They are only used when the head is at the inferior strait or low down in the cavity of the pelvis. (See Fig. 78, page 212.)

The *long forceps* besides the "cranial" have also a "pelvic" or "sacral" curve, by which they conform to the axis of the pelvic canal. (Fig. 79, page 213.) They may be applied at almost any part of the pelvis.

ACTION OF FORCEPS.—They act chiefly as *tractors;* slightly as *compressors;* scarcely at all as *levers.* They are aids to, or substitutes for, uterine contraction. They occupy but little space, owing to projection of the parietal protuberances through the fenestræ of the blades, which always occurs when the instrument is applied in its most favorable position, the long diameter of the head agreeing with the long direction of the blades.

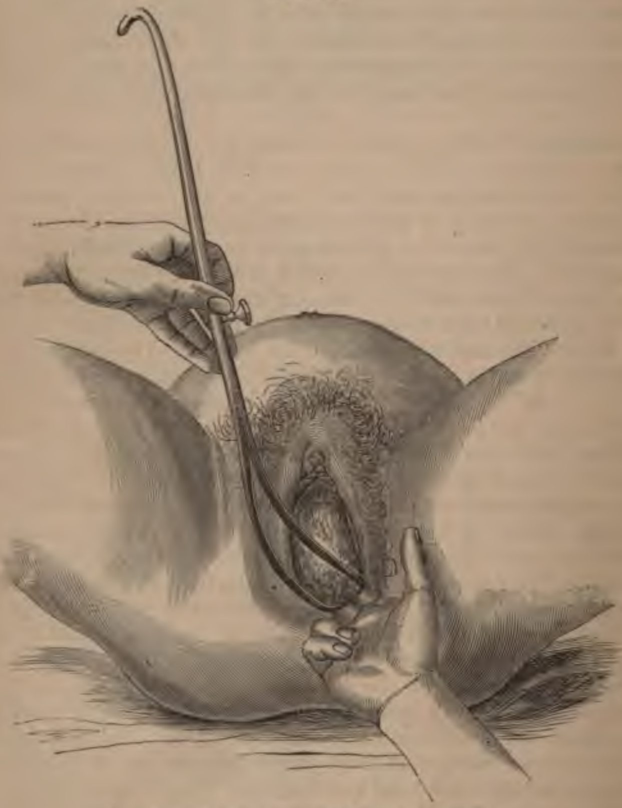
CASES IN WHICH FORCEPS ARE TO BE USED.—Generally speaking, in all cases where it is necessary to hasten delivery, provided their use for this purpose can be safely and successfully employed. The circumstances under which their application is to be preferred to other modes of operating, and the cases to which they are specially adapted, are so varied and numerous that they need not be recited here; they are considered elsewhere in connection with the different kinds of labor and their complications.

THE "HIGH" AND "LOW OPERATION."—When the head (or face) of the child is at the inferior strait, or low down in the pelvis, it constitutes the "low operation," and is comparatively easy. When the head is at or above the superior strait, or occupying the higher planes of the pelvic cavity, it is the "high operation." This distinction is important. Difficulty and danger of forceps operations increase, *cæteris paribus*, from below upward.

CONDITIONS ESSENTIAL TO SAFETY IN DELIVERY BY FORCEPS.—The os uteri must be dilated; the membranes ruptured; the rectum and bladder empty; the pelvis of sufficient size to admit the child; and the operator must possess a requisite amount of knowledge, strength, and manipulative dexterity. Forceps, however, may be applied *before* the os uteri is completely dilated (if it be patulous and dilatable), and before the head has passed through it, provided the dangers of delay are manifestly greater than the risks incurred by introducing the blades of the instrument into the uterus.

MODE OF APPLICATION AT THE INFERIOR STRAIT, WHEN THE OCCIPUT HAS ROTATED TO THE PUBIC SYMPHYSIS.—This is the simplest and most easy of all forceps operations. Place the woman on her back as already described for version. Anæsthesia may or may not be necessary according as the pain and difficulties to be anticipated are, respectively, great or little. Assistants, at least one even in the simplest cases, will be required, but an intelligent nurse will often be sufficient. The instrument must be warmed (by resting in a pitcher of warm water), wiped and oiled before being applied. The "left" ("male," "lower") blade is introduced first. Which of the two blades this *is* may be ascertained as follows: Before they are taken apart, look at the lock of the instrument, while it is held with the convex border of the sacral curve downward and the handles toward you, and ascertain which shank is uppermost: it is the one whose handle is toward your right hand (the "upper," "female," "right" blade). Lay it aside: the other blade, held in left hand, must be introduced first. Grasp it just above the lock, much in the same manner as you would a pen, so that the handle rests between the thumb and index-finger, and upon their junction. One or two fingers of the *right* hand are now *first* introduced between the child's head and left lateral wall of the vagina, and retained there, while the end of the blade is placed against their palmar surface, and by gentle pressure made to glide in and up between the head and fingers. (Fig. 80, page 216.) At first the end of the *handle* is directed rather toward the right thigh, but is gradually brought further down and toward the median line as the blade ascends the vagina. A gentle, *limited*, up-and-down movement of the blade, rocking it first up toward the pubes, then down toward the coccyx, may facilitate its entrance when the size of the head makes it a tight fit. The fingers inside, having ascertained that the blade is entering properly, are gradually withdrawn; and when the end of instrument has about passed the equator of the head, the left hand is placed above and nearer the end of the handle, which it now depresses toward the perineum, where it is held steady by an assistant, while the other blade, held in the right hand

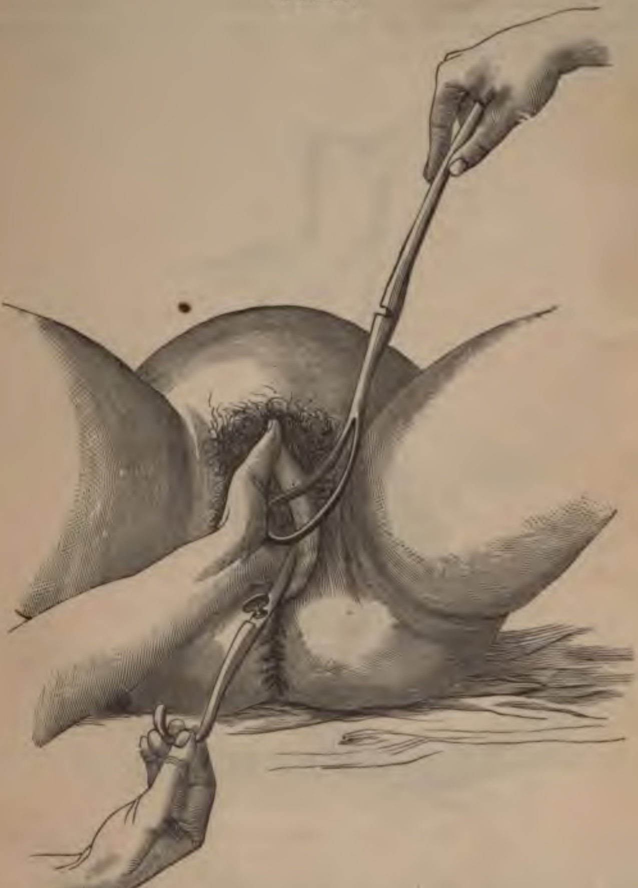
Fig. 80.



Use of forceps at outlet. Introduction of first blade.

and preceded by two fingers of the left, is introduced along the right lateral wall of the vagina on the other side of the

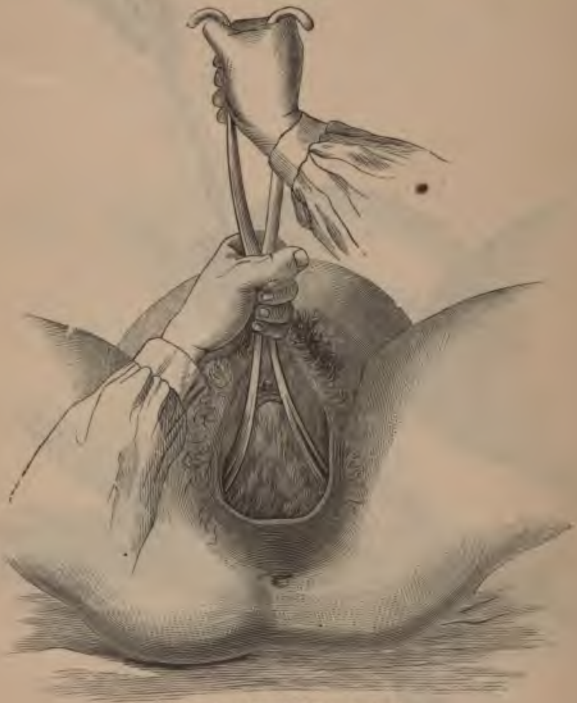
Fig. 81.



Introduction of second blade.

head, in an exactly similar manner as the first, Fig. 81. When properly applied, the second blade crosses the first one near the lock. The next step is to lock them. The operator, taking a handle in each hand, by slight adjusting movements gets both blades on a proper level, the lock slips into position, and the instrument is ready for traction. In forceps, like Hodge's, having a screw lock, the screw must be tightened before performing traction. In *applying* the forceps, proceed only *between* the pains; in using *traction*, only *during* the pains. In drawing out the head by traction, avoid haste and violent pulling (unless imperatively required); draw by the strength of the hands and arms, not by hanging the weight of the body on the instrument; direct traction in a line with the

FIG. 82.



Lifting handles to follow extension.

axis of the pelvis. While one hand grasps the handles let the other grasp the lock, and rest the tip of its index-finger against the occiput to guard against the head slipping out of the blades; in resting from traction-efforts between the pains, see that the handles are *not* held tightly together, so as to make *continuous* compression, by the blades, upon the head. Keep the handles well down until the occipital end of the occipito-mental diameter is beginning to escape under the pubic arch, then gradually lift them up, in a line with the axis of the outlet, toward the mons veneris, in order that "extension" of the occiput up in front of the pubic symphysis may take place, Fig. 82, page 218. Watch the perineum and guard it from rupture as the biparietal equator emerges. Readjust the instrument from time to time without withdrawing it, if necessary, to keep the long direction of the blades parallel with the long diameter of the head (especially during "extension"), otherwise the terminal extremities of the blades will project and injure the perineum or vagina. To avoid this risk more completely some operators take off the instrument, just before the head emerges, and finish delivery, if further artificial aid is necessary, by manipulation—a finger introduced into the rectum drawing on the chin. (Lusk.)

OSCILLATORY MOVEMENT.—During traction it is *not* necessary (as was formerly supposed) to sway the handles to and fro, laterally, with a view of levering the head out of the pelvis as a carpenter "rocks" a nail in withdrawing it from a board. Since there is no ratchet-like roughness either to the pelvic canal, forceps, or head, nothing can be gained by this movement, while the sweep it necessarily gives to the ends of the blades may injure the soft parts. In certain cases where the head is fixed and firmly impacted in the pelvis, such a motion may be justifiable to dislodge or loosen it, but after this the lateral movement is useless.

APPLICATION OF FORCEPS AT INFERIOR STRAIT, WHEN THE OCCIPUT HAS ROTATED TO THE SACRUM.—Forceps should not be applied at all in these cases, until a reasonable time has been allowed, and every proper effort made (see page 170) to promote anterior rotation, unless indeed accidental circumstances render delay dangerous. Then, however, the operation is as follows: The blades are put in exactly as described for cases where the occiput has rotated anteriorly. But since the occiput is now toward the sacrum *the extension will of course be downward and backward over the perineum,* instead of upward toward the pubes; hence the handles of the instrument, when the head emerges, must be directed *downward and backward,* instead of toward the *mons veneris.* A moment's reflection will show that the short *straight* forceps (without any *sacral curve*) must be used in these cases; for the said curve is only adapted to follow the axis of the pelvic canal, but during *backward* extension of the occiput over the perineum the head departs from the axial line and goes in an almost opposite direction. If the *curved* forceps were used, the ends of the blade would impinge against the pubic arch, while the handles were being depressed in following the movement of backward extension. Again, owing to the depth of the posterior pelvic wall being three times as great as that of the anterior one, there is so much the more difficulty in getting the occipital end of the occipito-mental diameter to escape over the edge of the perineum, hence greater danger of laceration, and necessity for extra care that the occipital pole *really* shall have cleared the perineum before extension is attempted.

In the cases of occipito-posterior rotation, in which the forehead, face, and chin successively escape under the pubes (which sometimes goes on while the forceps are being used), the case becoming a face presentation at the last moment (see "Mechanism of R. O. P. Position," page 166), the handles are elevated toward the pubes, for, the chin having emerged, the mechanism is completed by its *flexion* up toward the *mons veneris.*

APPLICATION OF FORCEPS AT INFERIOR STRAIT, WHEN THE OCCIPUT IS TOWARD ONE OF THE ACETABULA.—Here *no* rotation has occurred. The long diameter of the head occupies the same oblique diameter by which it entered the superior strait.

As a general rule, apply the blades just as if rotation *had* occurred, for, during subsequent traction, *rotation will take place inside the instrument.* The blades conform to the *sides of the pelvis,* but grasp the *head obliquely,* one over the *side* of the forehead, the other over the *side* of the occiput. They do not so nearly approach each other, hence the handles are wider apart, and the forceps are more apt to slip during traction—an accident to be avoided by additional care.

Another mode of operating is to place the blades over the *sides* of the unrotated *head*, one blade being passed in along the sacro-iliac synchondrosis, the other near the opposite acetabulum. When the instrument is thus adjusted, the handles will be directed a little toward that thigh corresponding with the acetabulum at which the occiput is placed. Before or during the first traction-efforts, the occiput is made to rotate to the pubes by gently directing the handles to the median line of the inter-femoral space. This mode of operating requires in most cases a special skill, and from its difficult execution has of late years been superseded by the simpler method first above given.

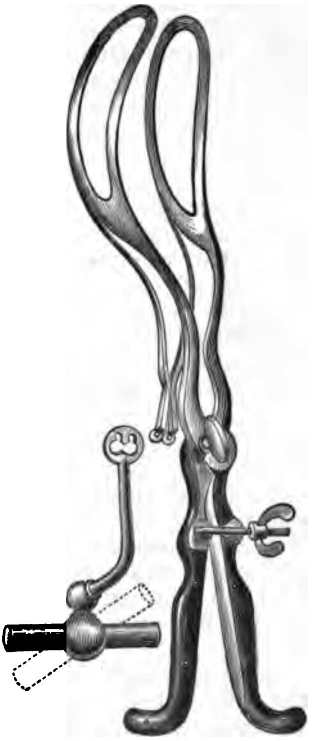
APPLICATION OF FORCEPS AT INFERIOR STRAIT WHEN THE OCCIPUT IS TOWARD ONE OF THE SACRO-ILIAC SYNCHONDROSES.—This is still more difficult than in unrotated *anterior* positions, but the two modes of operating just mentioned for them may here be employed (preferably the first one), noting the difference (when the second method is attempted) in the *direction* of rotation, viz., backward to the sacrum, instead of forward to the pubes.

APPLICATION OF FORCEPS WHEN THE HEAD IS IN THE PELVIC CAVITY BETWEEN THE TWO STRAITS.—General methods the same as already described. The instrument requires to be passed further up (hence long, curved forceps are necessary), and the traction must be made more in a backward direction, in conformity with axes of higher planes of pelvic canal, by directing the handles more decidedly downward toward the perineum while pulling efforts are being made.

In these cases, as in all others where the head may not have passed entirely through the os uteri, the fingers that precede the introduction of the blades should feel that the ends of the instrument *certainly* pass between the head and lips of the os, and not outside the latter so as to pinch it between the head and blade.

THE "HIGH OPERATION"—AT OR ABOVE THE SUPERIOR STRAIT.—It is very difficult. In many instances podalic version is safer and easier if the conditions favorable for it are present. The forceps are introduced in the usual manner, but of course higher up, so that even the lock may enter the vulva. The blades follow the *sides of the pelvis*, no matter what "position" the head may occupy, hence they grasp the latter obliquely, and there is great liability to slipping of the instrument, and danger of the tips of the blades injuring the interior of the uterus. Traction must be made very slowly at first, and *decidedly backward* and downward in line with

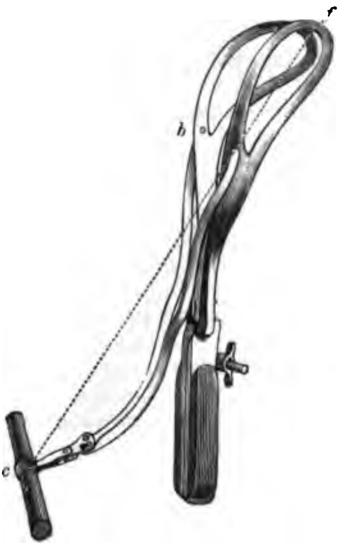
FIG. 83.



Lusk's modification of Tarnier's forceps.

the axis of the plane of the superior strait, by keeping the handles as near the coccyx as possible. To facilitate this backward traction, Tarnier has constructed a special instrument (Fig. 83, page 222) with curved handles, perforated by a screw to hold the blades in contact with the child's head; these handles steady the instrument and indicate the *direction* of traction; the *force* of traction is applied to the lower handle, or cross-bar, attached to the traction rods fastened to the blade at *b*. The direction in which axis-traction can be thus employed is well illustrated by the dotted line in Fig. 84 showing Simpson's modification of Tarnier's instrument. Hours may be required to bring the head down to the pelvic floor, and care must be taken to direct it in accordance with the natural mechanism of labor as far as practicable.

FIG 84.



Simpson's axis-traction forceps.

If the head is altogether *above* the superior strait, and *movable*—*i. e.*, not yet fixed in its position by any partial engagement at the brim—version should *certainly* be preferred to forceps.

DANGERS OF FORCEPS OPERATION.—Laceration and bruising of uterus, vagina, and perineum; the vaginal injuries sometimes involving rectum, bladder, and urethra, thus leading to subsequent ulceration and fistulæ; rupture or injury to veins and subsequent phlebitis; possibly fracture of pelvic bones and separation of pelvic joints when great force is employed. Dangers to the child are: abrasion, contusion, and laceration of the skin; depression or fracture of cranial bones; laceration of bloodvessels, and consequent subcutaneous hematocele; temporary facial palsy from injury to facial nerves.

The *prognosis* in forceps cases largely depends upon the conditions preceding and requiring their application, and upon the care and skill of the operator. It is, of course, more favorable, other things equal, in proportion as the head is low in the pelvis.

FORCEPS IN FACE PRESENTATIONS.—When the face is at the *inferior* strait and the chin has rotated to the pubes, the operation is easy and almost identical with that described for head cases with the occiput to pubic symphysis. The blades are applied on each side, and, after traction has brought the tip of the chin well out under the pubic arch, the handles are directed up, over the mons veneris, to promote delivery by flexion. Care must be taken to pass the blades *far back*, so that their terminal ends fit *round* the occipital end of the head instead of *digging into* it, when the handles are compressed.

When the chin is toward one of the acetabula at the lower strait, the same rules may be applied as for corresponding unrotated anterior positions of the occiput. In face cases, however, the chin is apt to be somewhat *behind* the acetabulum, nearer the centre of the ilium, the face and head more directly transverse in the pelvis, than occurs in vertex presentations. In these the blades cannot well be applied to the *sides of the pelvis*, but should be passed, one along the sacro-iliac junction and the other near the opposite acetabulum, so as to grasp the *sides of the head*, and rotation *must* occur, either spontaneously or by the aid imparted by the blades, *before traction can do any good.*

When the chin has rotated *to the sacrum*, delivery by forceps is mechanically impossible (see "Mechanism of Face Cases," page 178) if the fœtus and pelvis are of normal size. When the face is at the *superior strait*, or high up in the pelvic cavity, and circumstances require delivery to be hastened, version must be preferred to forceps. And when version cannot be accomplished, the only remaining resorts are craniotomy and Cæsarean section.

FORCEPS TO THE AFTER-COMING HEAD IN BREECH CASES—When the several manipulations already described for delivery in these cases fail, forceps may be tried.

In the more common cases in which occiput has rotated to pubes and forehead to sacrum, the body of the child is lifted up toward the mons veneris, and the blades are applied one on each side of the head, as before described, the handles being first depressed toward the perineum, especially when the head is high up, but made to follow the body toward the mons veneris, as the chin, face, and forehead successively emerge over the coccyx.

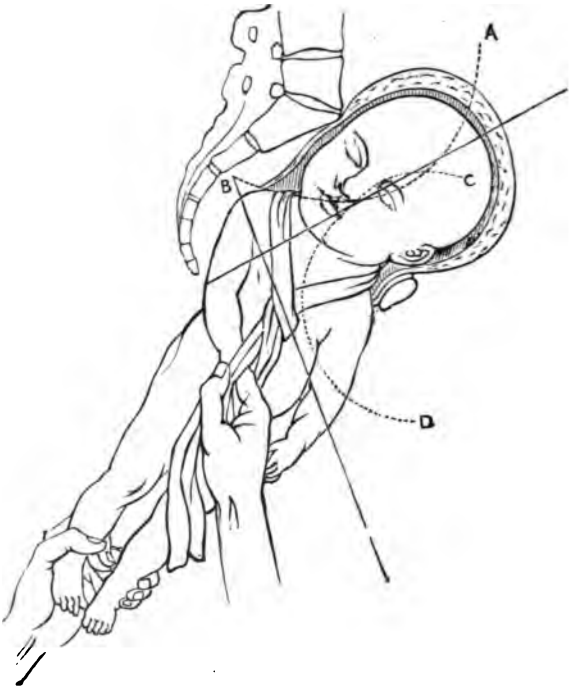
When the occiput has rotated to the sacrum, the direction in which the child's body is held during the use of the instrument will depend upon whether the chin is caught *above*, or dipping *below* the pubic arch. In the *former* (and rarer) case, the body is lifted toward the pubes, while the forceps are passed in to the occiput, which is drawn out *first* along the sacrum to the perineum ("continued extension"), the handles being lifted toward the child's back as the head is born.

In the latter case ("continued flexion") when the chin is *below* the pubes, the body must be depressed toward the perineum, while the blades, having been applied to the sides of the head, the handles (as the chin, face, and forehead come out under the pubic arch) are depressed toward the child's abdomen.

The application of forceps when the after-coming head is arrested at the *superior strait*, is an extremely difficult operation, and manual pressure from above, conjoined with every other means stated under the "Treatment of Breech Cases" (page 190), should be faithfully tried before attempting their introduction. Their use, however, is to take precedence of craniotomy in any case where this is likely to become necessary, especially if the child be still alive.

In these cases, and in those where the after-coming head is encircled by a resisting os uteri, Dr. Barnes advises backward traction by the feet, and upon the nape of the neck by encircling the latter with a fine napkin or silk handkerchief, as shown in Fig. 85.

FIG. 85.



Traction in after-coming head arrested high up.

CHAPTER XIX.

CUTTING OPERATIONS ON THE MOTHER.

THE cutting operations on the mother are: Symphysiotomy; Cæsarean Section; Laparotomy; Laparo-elytrotomy; Porro's operation.

SYMPHYSIOTOMY (Sigaultian operation): an operation invented by Sigault for enlarging the pelvis, in cases of deformity, by dividing the symphysis pubis, and separating the pubic bones from each other. Very little space is gained by the operation, and as it necessarily involves loosening of the sacro-iliac synchondroses and consequent liability to impairment of locomotion afterward, and as better means of delivery are available, it has been abandoned and become obsolete. It has, however, during the last fifteen years, undergone something of a revival in Italy, where the frequent occurrence of pelvic deformity, and the opposition of the Papal Church to mutilating operations upon unborn infants, have secured it some favor. But as its most earnest advocates, even here, scarcely venture to advise it in cases where the conjugate diameter measures less than 2⅝ inches, the real utility of the operation (if it possess any) is difficult to discern.

CÆSAREAN SECTION (GASTRO-HYSTEROTOMY, LAPARO-HYSTEROTOMY): an operation which consists in cutting through the walls of the abdomen and uterus, and extracting the child through the incision. The cases in which it is performed are: (1) *Extreme* deformity of the pelvis, in which delivery by craniotomy would be more dangerous to the mother than cutting into the uterus and abdomen; (2) certain cases of lesser pelvic deformity, in which craniotomy is possible, but Cæsarean section is agreed upon to *save the life of the child*; (3) mechanical obstruction in the pelvis from fibroid, cancerous, or bony tumors; (4) in women dying near the end of pregnancy, the child, if alive, is immediately extracted by post-mortem

Cæsarean section; (5) various other exceptional conditions resulting from inflammatory changes, constrictions, uterine displacements, etc., may, rarely, require the operation.

Prognosis and Dangers.—Death may result (1) from *hemorrhage* during or after the operation; (2) from *shock*, especially in women greatly exhausted; (3) from *peritonitis* and *metritis;* (4) from septicæmia. The percentage of maternal recoveries, *under the most favorable circumstances*, is, roughly, about fifty per cent.—in the United States seventy-five per cent. (Harris). The results of statistics notably unreliable. Unfavorable conditions, such as the atmospheric impurities of hospitals, previous exhaustion (both of woman and womb) from protracted labor; previous injury from unsuccessful attempts to deliver by version, forceps, etc.; bungling from lack of skill during the operation; and injudicious after-treatment, have largely increased the death-rate. To be successful, the operation should not be put off as a last resort, but performed early, the conditions requiring it having been made out, if practicable, at or before the beginning of labor.

Operation: to be performed under Listerism as in ovariotomy. Surgical instruments—scalpel, blunt-pointed bistoury, large grooved director, artery-forceps, Kœberlé's compressing forceps (several pairs), suture-needles, needle-holder, sponge-holders, silver wire sutures, carbolized silk or catgut sutures, and ligatures, will be required; together with new, soft, clean sponges; plenty of hot and cold water; a wide abdominal bandage, and the usual materials for Lister's dressing, etc. Five assistants will be necessary: one to give ether; one to hand instruments; one to manage the spray; one to receive the child, and, if necessary, resuscitate it from asphyxia; and the best and most reliable one to steady the womb and prevent escape of intestines, etc. The duties of this last—the chief assistant—are of great importance. If a novice, as may happen in the emergencies of rural practice, he should receive specific instructions before the operation is begun. It will be his duty, while the abdominal incision is being made, to steady the uterus in the median line and produce moderate tension of the abdominal wall over it, by standing on the left of the patient and facing her feet, while the ulnar edge of each hand is depressed on each side of the uterus, the thumbs grasping its fundus. When the abdominal incision is complete, he will continue lateral pressure to prevent escape of intestine, and keep the womb in the median line, pushing it somewhat forward. When the uterine incision is complete, he will at once hook an index finger into each end of it and thus lift the uterus into close contact with the abdominal wall. Lastly, during extraction of the child, he will resume lateral pressure upon the uterus, following down its retraction with special care to keep back the intestines.

The operator stands on the right of the patient, who should rest on a high, firm table, with her shoulders slightly elevated and the lower limbs moderately flexed. The bladder and rectum having been previously emptied, the abdominal incision is made with a scalpel, layer by layer, in the median line, from the umbilicus to within one and a half inches of the pubes. If greater length of incision be necessary, prolong it on one side of the umbilicus—not by cutting lower down. Twist or ligate any bleeding vessels in the abdominal wall, before opening the peritoneum. Lift up fold of peritoneum with artery forceps; nick it; pass in finger, or grooved director, and incise with blunt-pointed bistoury. The womb being now exposed, incise it layer by layer, in the median line, midway between fundus and cervix, a short incision being first made, through which a grooved director may be passed and the cut then lengthened to four and a half or five inches with blunt-pointed bistoury. On account of the bleeding, which is inevitable, this should be done with all prudent expedition. When the placenta is attached immediately under the incision, it may be detached on one side until the hand can pass; or, instead of this, the uterine incision may extend directly through the placenta, which is probably the better plan. The practice of incising the uterus on one side of the median line to avoid cutting the placenta, has of late grown into disfavor.

Should the membranes remain intact after the uterus is incised, they may be ruptured through the wound, the assistant keeping the uterine and abdominal walls in contact to prevent liquor amnii flowing into the peritoneal cavity, if possible.

The next step is to extract the child, if possible by its head; if not, by the feet. In the latter event, if the head become arrested, the incision may be enlarged. Cut the cord, its fœtal end being quickly compressed and afterward tied by the assistant who at once receives the child. Compress the uterus gently with the hands to promote spontaneous expulsion of placenta through the incision, assisting it by traction on the cord. If not spontaneously extruded in five or six minutes, the hand must be passed into the incision and the placenta and membranes extracted. Pass a finger through the cervix to insure patency of the os. Compress uterus more firmly and give ergot to promote contraction. Close uterine incision, in all cases, with interrupted silver sutures, placed one inch apart; intermediate superficial ones of carbolized silk being used to approximate the peritoneal edges. Cleanse abdominal cavity from blood, etc., with warm carbolized sponges. Lastly, close abdominal wound with silver sutures, and apply antiseptic dressings of silk, cotton-wool, gauze, and bandage, as after other surgical operations. Some practitioners insert a drainage tube in the lower end of the incision, its open end being protected from entrance of septic atmospheric germs.

After-treatment.—Absolute rest. Morphia suppositories to relieve pain and prevent action of the bowels, the latter to be kept quiet for five days. Catheter to empty bladder every six hours. Diet, chiefly milk, also beef-tea; cracked ice to relieve vomiting; or nutritive enemata instead of mouth-feeding, if the emesis persist. The antiseptic dressings may remain untouched three or four days, and the sutures a week or thereabouts. All subsequent dressings and removal of sutures under Listerism.

LAPAROTOMY (GASTROTOMY) simply means cutting through the *abdominal* wall *only*, and removing the child, the latter having already escaped from the uterus, wholly or in part, through a rent constituting rupture of the organ. Blood-clots and the placenta, if the latter have escaped into the abdominal cavity, must be carefully removed through the wound, and the case subsequently managed as in Cæsarean section. If the placenta be still in the womb, it must be removed, preferably *per vaginam*, or through the rupture, before closing the abdominal incision. The torn edges of the uterine wall may be united by silver wire sutures if the wound gape, or hemorrhage continue. Laparotomy is also employed in extrauterine pregnancy. In the tubal and ovarian varieties the cyst containing the fœtus is removed with it, and bleeding vessels secured as in ovariotomy operations. In the *abdominal* variety of extrauterine gestation, the abdominal and cyst walls are successively opened and the child removed, but the placenta if still firmly attached must be suffered to remain (from fear of hemorrhage), while the umbilical cord, or a stout string of whipcord fastened to the placenta near its middle, is left hanging from the lower end of the abdominal wound, and traction made on it from day to day until the placenta is found to be released, when it may be taken out through the lower end of the incision after removing one or two sutures.

LAPARO-ELYTROTOMY (GASTRO-ELYTROTOMY).—The chief purpose of this operation is to deliver through an abdominal incision *without opening the peritoneal cavity or incising the uterine wall.* The woman is placed as for Cæsarean section. Five assistants are required, one on each side of, and two facing the operator, who stands on the right of his patient; another gives ether. The os uteri should have been previously dilated, naturally or artificially, and the bowels emptied. One assistant (facing the surgeon's left) draws the uterus upward and to the left, thus stretching the skin in the right iliac region, where the incision is made, one inch above and parallel with Poupart's ligament, extending from a point 1¾ inches above and to the outside of the spine of the pubes, to an inch above the anterior superior spine of the ilium. The abdominal muscles are cut, layer by layer, and the fascia transversalis hooked up and carefully incised on a Key's hernia director, to avoid wounding peritoneum. Branches of superficial epigastric artery may require holding-forceps. With the finger-ends, the peritoneum is carefully separated from the transversalis and iliac fasciæ, until the vaginal wall is reached. The assistant at the operator's left holds back peritoneum and intestines with a fine, warm napkin; another one draws the body of the uterus upward and to the left, in order to expose vaginal wall on the right side; a third introduces female catheter into bladder, holding it "in the known direction of the boundary line between the bladder and vagina," below the ureter, on the side where the operation is being performed. A blunt wooden, or ivory, rod (resembling obturator of cylindrical speculum) is passed into vulva and vagina, by which the vaginal wall is lifted and made to protrude at the site of the incision. With a thermo-cautery, or galvano-caustic knife (the surrounding parts being protected by wet compresses), the vaginal wall is cut over the projecting rod, parallel with the ilio-pectineal line, and as far below the uterus as practicable, to avoid injuring *ureter*, Douglas's sac, and uterine arteries. The *short* incision thus made, is extended by *tearing* with the index finger-ends toward the sacral promontory and pubic symphysis, avoiding, in the latter direction, injury to bladder and urethra. The catheter is then withdrawn, the membranes (if still intact) ruptured, the fundus uteri tilted to the opposite side, and the os drawn by a finger toward the wound, through which the child is then extracted or delivered by forceps or version, as the presentation may require. The placenta is delivered by "expression" through the incision. The wound is cleansed by carbolized warm water—some of which must be injected per vaginam—and the edges of the abdominal incision are united by interrupted sutures, and the abdomen covered with antiseptic dressing. The bladder should be tested for fistulæ by injecting warm milk. If any are discovered they should be sewed up with catgut ligatures, which may remain. A speculum, placed in the wound, may be necessary to secure bleeding vessels during the operation, and, failing in this, the vagina as well as the womb may be tamponed with pledgets of cold, wet cotton.

PORRO'S OPERATION.—It is Cæsarean section *with excision of the womb and ovaries.* A modification of Porro's operation, by which the womb is lifted out through the abdominal incision, and constricted above the cervix to prevent hemorrhage, *before the organ is incised and the child extracted*, is known as the *Porro-Müller Operation.*

In Porro's original operation, the abdominal incision was made as for Cæsarean section; the uterus was then incised and emptied of its contents, after which it was lifted from the abdomen, when the *serre-nœud* of Cintrat was placed around it, just above the os internum, and made to constrict the tissues until bleeding from the cut uterine wall was arrested. The womb was then amputated, and the stump brought outside of the abdominal wound and held in position by strapping the handle of the *serre-nœud* to the patient's thigh.

In Müller's modification of Porro's operation, the abdominal incision must be about seven inches in length, to admit lifting out the yet unwounded uterus through it. This done, a rubber tube is thrown round the womb, just above the os internum, and drawn tight. The uterus is then quickly opened and the child extracted. The organ is then amputated by a bistoury, or scissors. The stump is next surrounded and compressed by a chain- or wire-*écraseur*, having a Pean attachment, so that it may remain and act as a clamp, after the handle is removed. The rubber tube is removed, and the stump, after being cauterized by Paquelin's cautery, is transfixed by long needles and fastened to the abdominal wall, the cut surfaces of the latter being nicely closed around it by the usual sutures. Antiseptic dressing, as a matter of course. This operation is constantly undergoing modification and improvements in its minuter details. The cases to which it is specially adapted, in preference to other methods, and its relative merit and danger when compared with laparo-elytrotomy and the Cæsarean section, are matters as yet so unsettled as not to admit of either statement or discussion in this work.

It has been recently suggested to improve the Cæsarean operation by temporarily constricting the cervix uteri with a rubber tube, so as to prevent hemorrhage while the uterus is being incised and the child delivered.

CHAPTER XX.

MUTILATING OPERATIONS UPON THE CHILD.

THE object of these operations is to reduce the size of the child, or divide it in pieces, so that delivery—otherwise impracticable—may be accomplished. Operating upon the *head* is called "craniotomy," upon the *body* "embryotomy." Since the term "embryotomy" literally means cutting the embryo, it is sometimes loosely used synonymously with "craniotomy."

The conditions requiring mutilation are chiefly malproportion between the size of the child and pelvis, or other mechanical obstacles to delivery. Many cases in which craniotomy is adopted as a last resort have already been referred to.

The several craniotomy operations are: 1. Perforation; 2.

Excerebration; 3. Cephalotripsy; together with a number of minor operative procedures and instrumental manipulations that have not received definite names.

PERFORATION.—"CEPHALOTOMY" consists in perforating the skull and breaking up the brain. Various "perforators" ("pierce-cranes") have been devised, most of them modifications of "Smellie's scissors." (See Figs. 86, 87, and 88.)

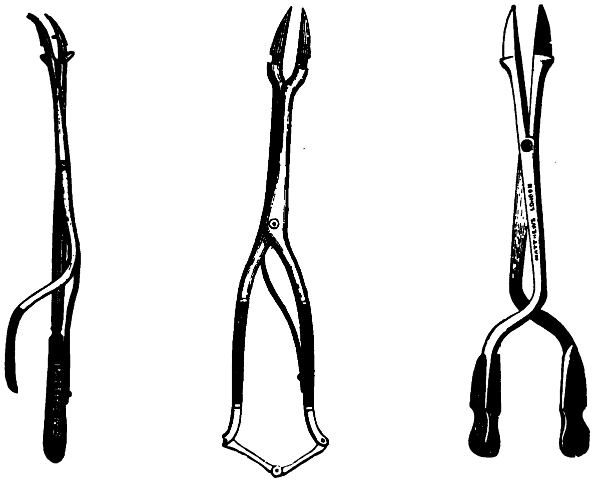
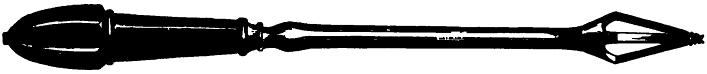


FIG. 86. FIG. 87. FIG. 88.

Various forms of perforators.

The instrument consists, in brief, of a scissors with long handles and short blades, the terminal inch of the latter forming a triangle whose apex is the point, and at the base of which is an elevated margin, or projecting shoulder-stops, to prevent a too deep penetration. Unlike ordinary scissors, the *outside* border only of the blades is sharp. Carefully guarded and guided by the fingers while entering the vagina, the point of the blades is mode to penetrate the skull, as nearly as possible at right angles to its surface to prevent glancing off, until further penetration is arrested by the shoulder-stops. The handles are then manipulated so as to open the blades, the outer edges of the latter thus making an incision in the cranium. After withdrawing the reclosed blade-points from the skull—not from the vagina—the instrument is twisted one-fourth of a circle and again applied as before so as to make a crucial incision. It is then pushed more deeply into the cranial cavity and turned about in all directions to break up the brain and its membranes, care being taken, if the child be alive, to kill it at once, by breaking up the medulla oblongata. The points to be preferred for penetration are, in head presentations, the parietal bone; in face cases the frontal bone, orbits, or roof of the mouth; and in retained head following breech presentations, the base of the occiput, behind the ear, or, if the chin can be pulled down, the roof of the mouth as in face cases. Avoid sutures and fontanelles; if these are penetrated, the bones afterward overlap each other and close the opening. Modern perforators have been constructed on the principle of the trephine. A round hole is cut in the cranium through which the brain may come out, but the scissors are best when it is desired to break up the bones afterward; or the more modern perforator of Tarnier may be used, especially when the head is movable above the pelvic brim, and the scissors are liable to slip off from it. (See Fig. 89.)

FIG. 89.



Tarnier's perforator.

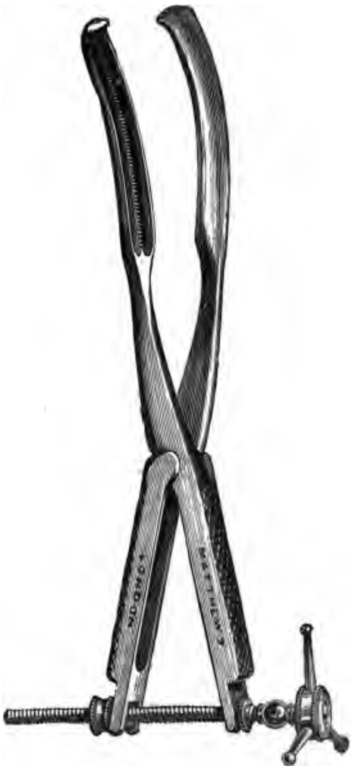
Contraction of the uterus together with resistance of the pelvic walls, after perforation, may cause the brain to ooze out and sufficiently reduce the side of the head to admit of its passage through the pelvis; generally, however, further artificial aid is necessary.

EXCEREBRATION (DECEREBRATION) is the next step after perforation. It means removal of the brain. This is done by a scoop or spoon passed in through the opening, or a strong stream of water may be injected with an ordinary Davidson's syringe and the cerebral mass washed out.

When collapse of the head after these measures is still not sufficient for delivery, compression and traction may be made by forceps or by the cephalotribe.

Cephalotripsy consists in crushing the skull with the cephalotribe, an instrument composed of two thick, narrow solid blades, which are applied singly (like forceps), and after being locked are made to approach each other by means of a screw running transversely through the handles, so that pow-

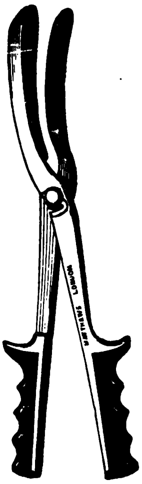
Fig. 90.



Cephalotribe.

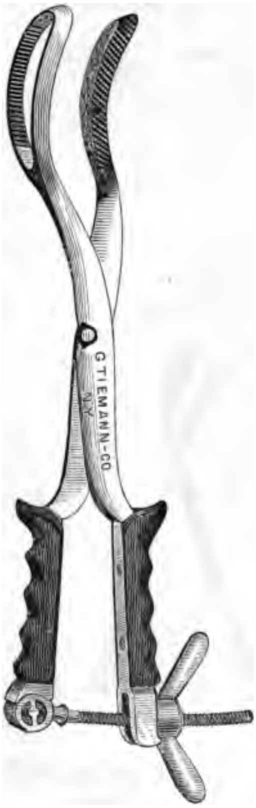
erful compression is made upon the skull, and its bones crushed; or, without crushing, the instrument may simply be used for compression and traction after perforation (Fig. 90, page 236.)

FIG. 91.



Cranioclast.

FIG. 92.



Brown's cranioclast.

In cases where the cranium cannot be delivered at all in its entirety, it must be broken up and removed piecemeal with the cranioclast or craniotomy forceps.

The *cranioclast* (Figs. 91 and 92, page 237) is a strong, solid pair of forceps, with small, duck-bill shaped blades, serrated on their opposing surfaces. One blade goes *inside* the skull (through the perforation previously made), the other *outside*, but underneath the scalp. They are introduced separately and lock like forceps. When applied, the inside blade, which is smaller than the other and has no fenestra, apposes its convex serrated surface against the concavity of the cranium, while the outside one—larger and having a fenestra against which the other may press—rests its concave serrated surface upon the convex exterior of the skull. When the handles are brought together after locking, the blades grasp the intervening bone, like the jaws of a crocodile, when it may be

Fig. 93.

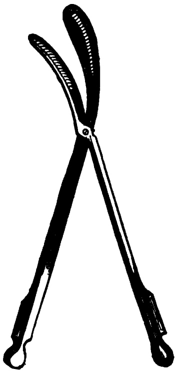
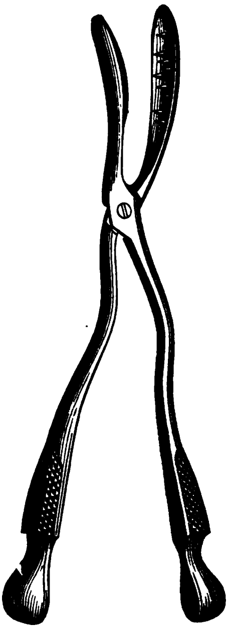


Fig. 94.



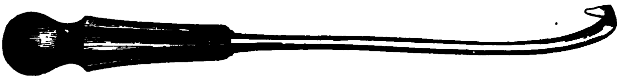
Craniotomy forceps

wrenched off by a twist of the wrist, and removed. Thus, a bit at a time, the whole vault of the cranium may be brought away. The cranioclast may also be used as a tractor, when, after perforation, it is attempted to extract the skull in its entirety.

The *craniotomy forceps* (Figs. 93 and 94, page 238) differ from the cranioclast in being smaller, and in having their blades permanently joined at the lock, like ordinary tooth-forceps. The inner surfaces of the blades are serrated: some are straight, others bent at right angles. They are used to grasp, twist off, and extract pieces of bone, the point of *one* blade going *into* the skull, that of the *other outside* of it, but *under the scalp*, this last having been previously loosened from its attachment to the bones.

In all these operations the greatest care is necessary to avoid lacerating the soft parts while withdrawing sharp bony fragments. The vaginal wall must be pushed aside by the fingers, or, better, a large cylindrical, or a Sims's speculum used, and the operation conducted under the guidance of sight instead of touch.

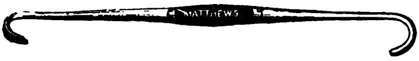
FIG. 95.



Crotchet.

The *crotchet* (Figs. 95 and 96) is a steel rod, the end of which, flattened into a sharp triangular point, is bent round, at an acute angle, to form a hook. It is passed into the cranium through the foramen magnum, or through a perforation made

FIG. 96.



Crotchet.

in some solid part of the base of the skull, and its point made to penetrate the bone from within outward, so as to get a hold by which traction can be made. A finger end is placed outside, opposite the point of the hook, to prevent laceration in case the instrument slips, or tears out. The "guard-crotchet" has a second solid blade (attached to the other by a "lock"), the end of which takes the place of the finger in fitting over the hook to prevent injury. However constructed, the crotchet is a formidable contrivance, and since fearful laceration will often occur, despite all "guards" and care, is now seldom used.

When the chief part of the cranial vault has been removed, by the cranioclast, etc., extraction of the remaining base of the skull, which is too solid to be broken up, may be facilitated by inserting a blunt hook in the orbit, or getting a firm hold on the forhead with craniotomy forceps, and then, by making downward and backward traction, *bringing down the face.* The symphysis of the lower jaw is next divided, and the two halves of the bone pushed aside or removed, when the remaining portion of the face, from the alveolar border of the upper jaw to the root of the nose—only measuring 1½ inches—may be made to enter the pelvis, and the base of the skull extracted.

Generally speaking, a pelvis sufficiently large to allow extraction of the head by craniotomy, will permit the body to pass without mutilation. It may be necessary, however, to pull on the neck until a blunt hook can be passed into the axilla, by which the shoulders—first one, then the other—may be drawn out.

Exceptionally it may be required to perform

EMBRYOTOMY.—This embraces two operations, viz.: evisceration and decapitation.

EVISCERATION (EXVISCERATION, EXENTERATION) means opening the thoracic and abdominal cavities (one or both), and taking out their viscera.

It may, though very rarely (as just explained), be necessary in extracting the body after craniotomy, or when there is some abnormal enlargement, or monstrosity, on the part of the child. It is resorted to more frequently in impacted transverse presentation, arrested "spontaneous evolution," etc.

Operation.—The thorax is penetrated near the axilla, by curved scissors or the pierce-crane, and the thoracic organs broken up and removed, either by instruments, or, if practicable, by the fingers. Through the same opening the diaphragm may be perforated and the abdominal viscera removed. The same care is necessary as in craniotomy to avoid lacerating the vagina with splinters of bone.

When evisceration is performed subsequent to craniotomy, the body may be afterward drawn out by a blunt hook in the axilla, as above directed.

In impacted transverse presentations the eviscerated body may be delivered in one of three ways, viz.: 1, by traction on the arm and shoulder; 2, by passing a blunt hook to the groin and pulling down the breech; 3, by grasping the feet and delivering by podalic version. Which mode is to be selected must be left to the judgment of the obstetrician, much depending upon the position of the child, its size, and the shape and dimensions of the pelvis.

DECAPITATION—separating the head from the body—is required in impacted shoulder presentations, or arrested "spontaneous evolution," when the child is jammed tight in the pelvis and cannot be moved up or down.

Operation.—Get down an arm for traction, pass a blunt hook round the neck, and while it is held as low down as possible, nibble through the vertebræ and soft parts with a blunt-pointed pair of scissors. Cut everything, so that the hook or finger may be passed through the incision to ascertain that the head and body are *completely* separated.

Another device is that of a blunt hook, whose inner concave surface is made sharp. The hook having been passed over the neck, the latter is separated by rocking the handle of the instrument up and down while traction is made. Keep a finger on the end of the hook, and reduce the traction force when severance is near completion, to prevent injury from sudden release of the instrument.

Other contrivances consist of chains, wires, and strings passed round the neck, and through a long, double canula, to protect the vagina, while, by a sawing to-and-fro movement, the neck is severed.

After decapitation, the head is pushed up out of the way and the body delivered first, by traction on the arm, evisceration, etc. The remaining head is then extracted by forceps, or, if required, by craniotomy. In attempting the latter operation upon a decapitated head, extra care is necessary to prevent slipping of the perforator. An assistant steadies the uterus by firm abdominal pressure to keep the head from revolving while the instrument is being used.

Finally, in all mutilating operations upon the child *when it is alive*, the chances of a successful cutting operation upon the mother for its safe removal should first receive consideration. In deciding which course to adopt, the value of the mother's life must be allowed the preëminence.

CHAPTER XXI.

PELVIC DEFORMITIES.

A GENERAL study of pelvic deformity is necessary, in order that we may learn to ascertain—at least approximately—the *degree* and *kind* of malformation existing in a given case. A knowledge of the *degree* of deformity indicates whether delivery by the natural passages is, or is not practicable, and determines the mode of assistance by operative measures. A knowledge of the *kind* of malformation, derived chiefly from examination of specimens in museums, indicates what diameters are most likely to be altered in length, and what parts of the pelvis—brim, cavity, or outlet—are chiefly affected, thus determining necessary modifications in the mechanism of labor, and indicating the *time* and *manner* of rendering assistance.

By far the most frequent variety of deformity is that in which there is *shortening of the conjugate* (antero-posterior) diameter of the *brim*, and while slight variations in size and shape are almost endless in number, twelve distinct types may be enumerated, each of which will now be considered.

1. THE SYMMETRICALLY ENLARGED PELVIS (PELVIS ÆQUABILITER JUSTO-MAJOR).—Shape natural; size, in all directions, increased. A congenital condition. Labor is apt to be unnaturally rapid, with consequent liability to inertia of the uterus and post-partal hemorrhage, and there is increased tendency to uterine displacements. *Treatment:* confine the woman to the recumbent posture as soon as labor begins;

rupture the membranes early, before the os is dilated, and enjoin resistance to bearing-down efforts, that labor may be prolonged. Extra care to secure uterine contraction during third stage of labor.

2. THE SYMMETRICALLY CONTRACTED PELVIS (PELVIS ÆQUABILITER JUSTO-MINOR).—Shape natural; size, in all directions, lessened. A congenital variation. Labor difficult, or impossible, according to degree of contraction. Occurring in dwarfs, children may sometimes be born without difficulty.

3. THE JUVENILE PELVIS.—Shape resembles the pelvis of infancy and childhood. It is an arrest of development. Transverse measurements relatively shorter than the conjugate, owing to narrowness of sacrum. Sides of pelvis unnaturally straight; pubic arch narrow; and ischia too near together. Labor difficult, or impossible *pro re nata*. In precocious mothers time may remedy the *deformity*.

4. THE MASCULINE PELVIS.—Sometimes called "funnel-shaped." It is deep and narrow, resembling that of a male, the narrowness increasing from above downward; hence obstruction to labor, most marked toward the outlet. The pelvic bones are thick and solid, a condition thought to be produced by laborious muscular work only suitable for men.

5. THE PELVIS OF RICKETS (RACHITIS).—Sub-varieties numerous. The *typical* rachitic pelvis is the most common, and hence most important of all deformities. Obstruction to labor chiefly at the *brim*, by shortening of *conjugate diameter*. Transverse diameter may be either long, short, or normal. Rickets occurs in early life. The child, from muscular weakness, etc., fails to *walk*, hence long continuance in sitting posture forces promontory of sacrum forward and downward toward pubic symphysis. If the child *does* walk, counter-pressure of thigh bones in acetabula forces in the *sides* of the pelvis, and then *transverse* diameter is *also* shortened. *Cavity* of pelvis not generally contracted, a sitting posture rather tending to squeeze the ischial bones apart. The *outlet* may be lessened by sharp inward curvature of sacral apex toward pubes.

Exceptionally the symphysis pubis is drawn (by contraction of recti muscles?) toward the sacral promontory, producing so-called figure-of-8 pelvis, and, *rarely*, the sacrum may *lack* curvature, thus lessening the size of pelvic *cavity*.

The rickety pelvis is a most prolific cause of difficult labor. The degree of obstruction may require mutilation of the child, or even necessitate cutting operations upon the mother. (For general rule in selecting the mode of operation, see page 255.)

6. THE MALACOSTEON PELVIS, resulting from osteomalacia—a uniform softening of the bones occurring in *adult* life. It may come on in women who have previously borne children without difficulty. Its progress being gradual, the patient is able to *walk* about, hence pressure of thigh bones in acetabula pushes in the *sides* of the pelvis, shortening the *transverse* diameter. Anterior border of pelvic brim has a spout-shaped or beaked appearance. Exceptionally, and in very bad cases, the oblique and conjugate diameters may be also contracted. Osteomalacia is about four hundred times less frequent than rickets. Craniotomy or Cæsarean section may be required for delivery. Sometimes the softened bones yield, and admit the passage of the child by other methods.

7. THE OBLIQUE DEFORMITY OF NAEGELÉ.—The sacro-iliac synchondrosis of *one* side is anchylosed, the corresponding wing of the sacrum atrophied, or imperfectly developed, so that the acetabulum of *this* side approaches the healthy sacro-iliac synchondrosis of the other, shortening the oblique diameter between these two points. The other oblique diameter, starting from the *diseased* sacro-iliac synchondrosis, is lengthened, owing to the symphysis pubis and acetabulum of the healthy side being forced out of place toward the sound side of the median line. This variety of deformity is comparatively rare.

8. THE "ROBERTS PELVIS."—A double oblique deformity. *Both* sacro-iliac synchondroses anchylosed, and *both* wings of the sacrum absent or undeveloped. The brim is oblong; pelvic sides more or less parallel with each other; ischia pressed toward each other, and sides of pubic arch nearly parallel. Transverse diameter *universally* shortened, at brim, cavity, and outlet. Obstruction very great, requiring Cæsarean sec-

tion. It is really the oblique deformity of Naegelé occurring on both sides, and is extremely rare.

9. THE SPONDYLOLITHETIC PELVIS, due to forward and downward dislocation of the lumbar end of the spinal column, from its proper place of support on the base of the sacrum. It produces marked contraction of conjugate diameter of the brim, and, owing to sacral promontory being forced somewhat backward, the apex of sacrum may be tilted forward, thus lessening conjugate diameter of outlet. Degree of obstruction very great, sometimes requiring last resorts in operating.

10. THE KYPHOTIC PELVIS, due to backward curvature of the spinal column near its lower end. The sacral promontory is absent or drawn backward out of reach, thus *lengthening* conjugate diameter of brim, but *contracting* its *transverse* measurement. The apex of sacrum is tilted forward, and the two ischia and two sides of pubic arch approach each other, so that *all* the diameters of the *outlet*, and some of the cavity, are diminished. Obstruction chiefly at the inferior strait.

11. DEFORMITY FROM HIP DISLOCATION occurs in hip-joint disease. Head of femur presses on innominate bone and pushes in side of pelvis, thus shortening transverse diameter of the brim. The *inferior* parts of the innominate bone are tilted outward, hence capacity of *outlet* increased.

12. DEFORMITY FROM EXOSTOSIS, ETC.—Bony and osteo-sarcomatous tumors growing from pelvic bones—most often from front of sacrum—project into pelvic cavity and produce obstruction. Bony projections also occur from callus resulting from fracture of the bones. The ischial spines are sometimes too long, and encroach upon the pelvic canal.

ORDINARY SYMPTOMS OF PELVIC DEFORMITY WITHOUT REFERENCE TO ANY SPECIAL CASE.—Previous history of difficult labors, and of the diseases or accidents by which pelvic deformity is produced. Early recognition of quickening by the patient (third month). Pendulous belly. Increased obliquity and mobility of the pregnant womb. Greater liability to malpresentations, and to presentation and prolapse of the funis. During labor the finger can be more easily introduced between the lips of the os uteri and bag of waters. Os uteri movable from side to side. Presenting part high up, or out of reach, when brim contracted. Pains intense without proportionate progress in descent of presenting part. Later, "arrest" of the head (it descends no further), or "impaction" (when it cannot be moved, either up or down). Caput succedaneum unusually large, its gradual swelling may be mistaken for progress in descent.

ADDITIONAL SYMPTOMS IN SPECIAL CASES.—In *Rickets:* "bow-legs," curved spine, and other deformities of the skeleton, with history of rachitis in early life.

In *osteomalacia* (malacosteon): probable history of previous labor without difficulty, the disease beginning soon after a delivery. Symptoms of osteomalacia are: pains in bones of pelvis and lower limbs; bones tender on pressure, especially over symphysis pubis. They are also pliable, yielding to manual pressure during labor. Old-standing cases of *hip disease* with dislocation of femur, present previous history of coxalgia. The diagnosis in the above cases must be confirmed, and in the other varieties made out almost entirely, by measuring the pelvis (Pelvimetry).

PELVIMETRY may be accomplished both by internal and external measurements. The best *pelvimeter* (pelvis-measurer) is the *hand.*

To measure conjugate diameter of the brim, pass index finger under pubic arch and rest its point against sacral promontory[1] (Fig. 97, page 247). (It is not possible to *touch* the promontory in a *normal* pelvis.) With a finger-nail of the other hand, make a mark on the examining finger where it touches the pubic arch. Withdraw the finger and measure (with a rule) from the mark to its tip. From this measurement deduct half an inch, and the remaining length gives the conjugate diameter of the brim. The half inch is subtracted because the length as measured from the promontory to the *under* surface of the pubic symphysis is half an inch longer than from the promontory to the *upper* surface of the pubic joint, the latter being the *brim* measurement it is desired to ascertain. During this examination the woman should lie on the back with the hips elevated.

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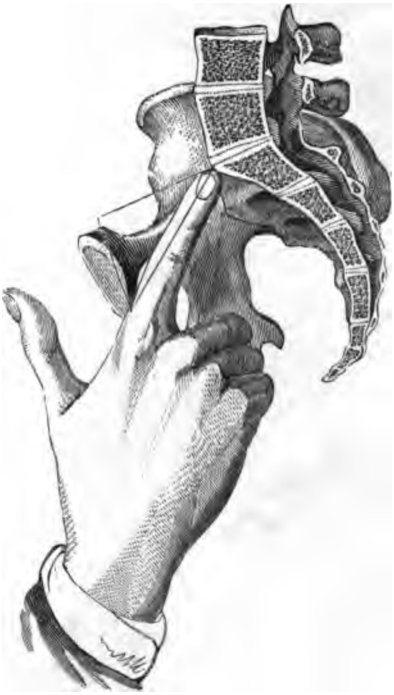
[1] Take care not to mistake the (sometimes prominent) junction of first and second sacral vertebræ for the *real* promontory.

Another method: patient lies on her left side, near the edge of the bed. Etherize if necessary to prevent pain. Introduce entire hand into vagina, and dispose it flat-ways with the little finger toward symphysis pubis and the index-finger against sacral promontory. Learn how many fingers can thus be *simultaneously* introduced between the two points. The breadth of four fingers, in a hand of average size, is about

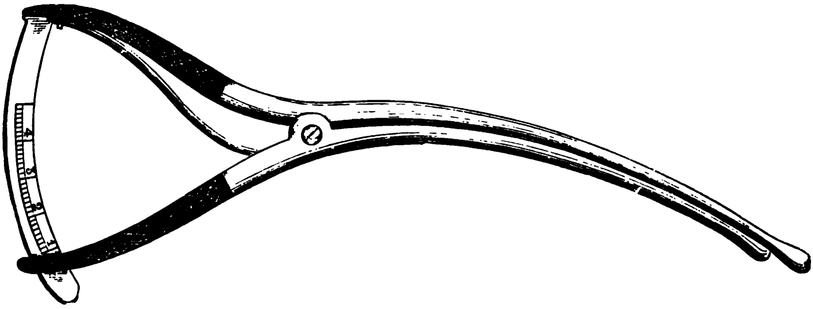
FIG. 97.



Pelvimetry with the finger.

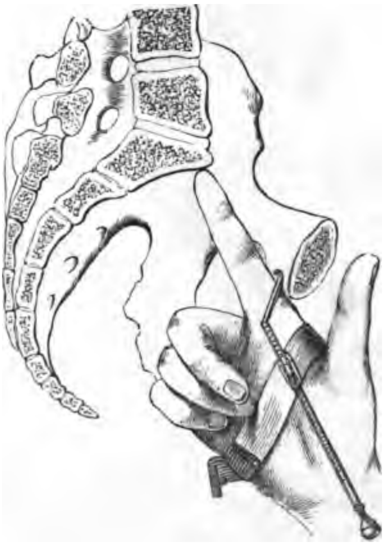
two and three-quarter inches. The fingers introduced may be afterward measured by a rule.

FIG. 98.



Lumley Earle's pelvimeter.

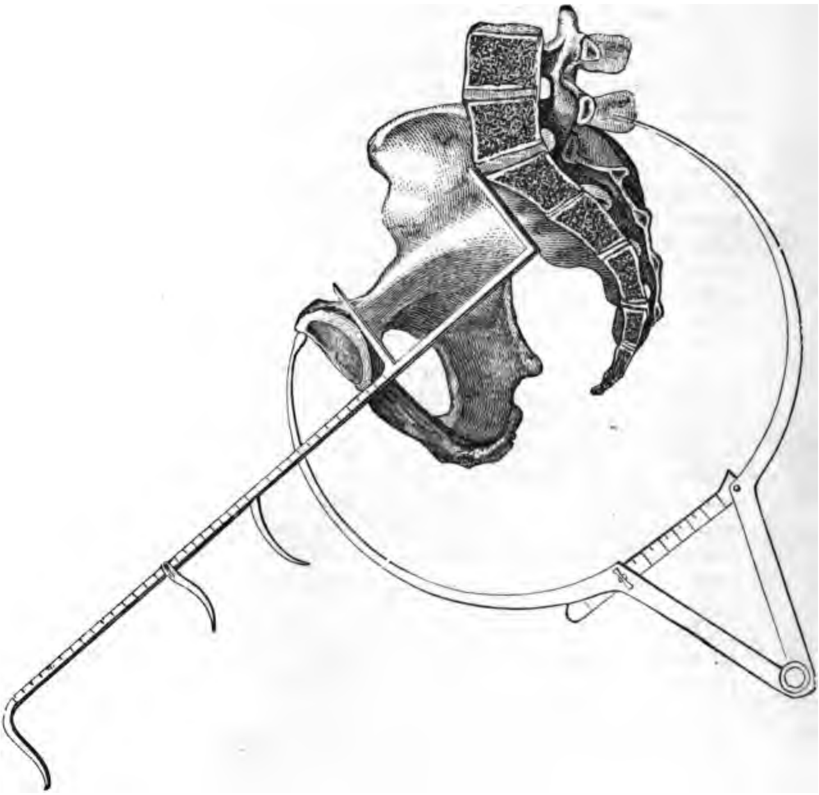
FIG. 99.



Greenhalgh's pelvimeter.

Of the numerous instrumental pelvimeters for internal use, those of Dr. Lumley Earle and Dr. Greenhalgh are probably the best; but they can scarcely be used during labor when most often needed, and give no better results than the hand under any circumstances.

FIG. 100.



Baudelocque's callipers. This figure also shows Coutouly's pelvimeter applied.

The *transverse* and *oblique* diameters of the *brim* can only be roughly estimated.

External Pelvimetry.—The pelvimeter of Baudelocque is generally used. It is a pair of circular callipers, a scale near the hinge indicating the space between the open ends when applied.

To measure conjugate diameter of brim, the woman lying on her side, place one point of the instrument upon the *upper* edge of pubic symphysis, and the other opposite sacral promontory—*i. e.*, over the depression, just below spinous process of last lumbar vertebra. Normally this should measure 7½ inches. Deducting 3½ for thickness of bones and soft parts, leaves 4 inches—the normal length of the brim's conjugate diameter. The degree of reduction in this measurement, allowing for individual variation from obesity, etc., will give, *approximately*, the amount of pelvic contraction, but a limited reliance only can be placed upon this method without other corroborative evidence of deformity.

Two other external measurements are useful, viz., (1) between the two anterior superior spinous processes of the ilia (normally 9½ inches); and (2) between the most laterally projecting points on the two *crests* of the ilia (normally 10½ inches). When both measurements are reduced, it indicates a uniformly contracted pelvis. When the inter-crestal measurement is normal, or only a *little* diminished, while the inter-spinous one is increased, it indicates a pelvis with conjugate contraction of the brim, but otherwise normal. When *both* measurements are *decidedly* diminished, while the inter-spinous one exceeds the inter-crestal, other diameters are contracted *beside* the conjugate.

Diagnosis of the Oblique Deformity of Naegelé.—Lameness, from inequality in the height of the hips. If two plumb-lines be suspended, one from the centre of the sacrum, the other from the symphysis pubis (the patient standing erect), the pubic one will deviate toward the healthy side. Measuring from the spinous process of the last lumbar vertebra to the anterior and posterior spinous processes of the ilia, will show a reduction of half an inch or more on the diseased side. Anatomical features of the deformity, already described, to be further made out by vaginal examination.

Diagnosis of the Kyphotic Pelvis.—Mensuration reveals marked narrowing of space between tuberosities of the ischia;

between ischial spinous processes; and between sides of pubic arch. Space between anterior superior spinous processes of ilia decidedly increased. Absence of sacral promontory and other anatomical characters revealed by vaginal touch.

DIAGNOSIS OF SPONDYLOLITHETIC PELVIS.—Figure peculiar; thorax normal; abdomen short and sunken between crests of ilia, the latter widely separated. Aortic pulsations felt through posterior vaginal wall. History of violent pains in sacrum at puberty (?). Vaginal examination reveals dislocation at sacro-lumbar articulation.

DIAGNOSIS OF "ROBERTS PELVIS."—Owing to narrowness of sacrum, the spaces between the two iliac crests, between the two iliac spines, between the two trochanters, and between the two ischial tuberosities, are all reduced. The two posterior superior iliac spinous processes, especially, approach each other.

DIAGNOSIS OF MASCULINE PELVIS.—Mensuration demonstrates diminished width between pubic rami, and between ischial tuberosities, etc. No obstruction to labor at superior strait; head arrested in pelvic cavity.

DANGERS OF PELVIC DEFORMITY.—Tedious labor; shock; exhaustion, and inertia of uterus from prolonged contractile efforts. Inflammation, ulceration, and sloughing of maternal soft parts from contusion and prolonged pressure. Child's life jeopardized by prolapsed funis; by continued and exaggerated compression of cranium, especially against sacral promontory. Operative measures for delivery may necessitate destruction of infant.

MODIFICATIONS IN MECHANISM OF LABOR WHEN CONJUGATE DIAMETER OF BRIM ONLY IS CONTRACTED.—Flexion is imperfect. The occipito-frontal diameter of head occupies transverse of pelvic brim. The "obliquity of Naegelé" is exaggerated, so that *anterior* parietal boss presents near pubes, while *posterior* one is tilted backward and upward toward posterior shoulder; hence, sagittal suture is carried toward sacral promontory. Thus anterior end of biparietal diameter is permitted to descend before posterior one: there is not space for both to enter simultaneously. The somewhat wedge-shaped *sides* of head, impinging against promontory and pubes, now cause occiput to slip, laterally, toward that ilium to which it points, thus bringing the narrower bitemporal diameter (3¼ inches) to occupy the contracted conjugate in place of the wider parietal one. As descent thus proceeds, the forehead and larger fontanelle are lower than occiput and small one; but, later, flexion occurs, which brings occiput down on one side of pelvis, while forehead rises up on the other. In this way the brim is passed, when, the chief difficulty being over, occiput rotates to pubes, and labor is completed in the usual manner.

MODIFICATIONS IN MECHANISM OF LABOR WHEN PELVIS IS UNIFORMLY CONTRACTED.—The head may enter in any pelvic diameter, though usually in the oblique. Flexion is unusually complete, so that occipital pole of occipito-mental diameter points almost vertically down at right angles to plane of superior strait. The "obliquity of Naegelé" is very slight, or absent. Both parietal bosses enter at same time. Small fontanelle found near centre of pelvis. Should transverse narrowing continue toward outlet, the *extreme flexion* continues, with liability to impaction and arrest; but if the pelvis widen below the brim, the exaggerated flexion lessens, and the occipital pole of the head leaves its central position, and rotates, in the more favorable cases, toward the pubes, when delivery follows in the usual way.

MODIFICATIONS IN MECHANISM OF LABOR WHEN PELVIS IS "GENERALLY CONTRACTED" WITH ANTERO-POSTERIOR FLATTENING.—In this case we have the "Naegelé obliquity" of flattened pelvis, joined with the exaggerated flexion of justo-minor cases. The occipito-frontal diameter of the head usually occupies the transverse diameter of the pelvis. If delivery be possible, strong flexion causes the occiput to descend first.

DEFECTS IN MECHANISM REQUIRING RECTIFICATION.—In pelves with very narrow conjugate and high promontory, especially, but sometimes in others that are less so, the "obliquity of Naegelé" is *over*done. The posterior parietal bone is bent *too* strongly toward posterior shoulder, so that sagittal suture may be even *above* sacral promontory, and the ear be felt just behind pubic symphysis. In flattened pelves with transverse shortening, the obliquity may be the other way. The *posterior* parietal bone presenting, the sagittal suture being toward or even above pubes, while an ear is felt near promontory. Again, the proper deficiency of flexion in the early stage of labor in flattened pelves may be overdone, thus leading to brow or face presentation, and in which anterior rotation (respectively) of forehead or chin will be impossible later on.

During breech deliveries, in contracted pelves, the arms may be displaced to the sides of the head, and this last may be unfortunately extended by the chin catching against pelvic brim. In marked transverse shortening, extension of the chin in breech cases makes delivery impossible without perforation.

METHODS OF ASSISTING DELIVERY IN PELVIC DEFORMITY.—Excluding, for the present, the induction of labor before full term (to be considered in the next chapter), the resources of the obstetrician in pelvic deformity are: Forceps, version, craniotomy, and Cæsarean section (or one of its allied abdominal operations). The definition of *precise* rules for deciding which of these procedures must be selected in a given case, is a quite impossible undertaking. Of the many points to be considered, one of the most important is the degree of shortening in the conjugate diameter of the superior strait. In so far as this is concerned, it may be stated as a *general* rule, which, however, must be accorded sufficient elasticity to allow of its conforming to other elements of importance hereafter noted, that

When conjugate diameter of brim measures—	The proper mode of delivery is—
Between 4 and 3½ inches,	By forceps.
Between 3½ and 2¾ "	By version.
Between 2¾ and 1¾ "	By craniotomy, or, if child be alive, by Cæsarean section.
Below 1¾ inches,	By Cæsarean section, *not* by craniotomy.

As before stated, and as a matter of course, selection of the method of delivery must *not* depend *solely* upon the length of the conjugate diameter. Since we cannot, during labor, measure the pelvis *exactly*, and still less the child's head, the impossibility of mathematical rules for practice is painfully evident.

Among the host of other considerations upon which our selection must, in part, depend, may be mentioned: 1. The *kind* of contraction: whether (*a*) simple antero-posterior flattening, or (*b*) general contraction, or (*c*) both of these combined. 2. The site of contraction: whether at brim, cavity, or outlet. 3. The estimated size of the head and its degree of ossification. 4. Whether or not, it be "arrested," or "impacted" (and at what point in the pelvis), or have passed through the os uteri. 5. The amount of dilatation of the os, and the state of the membranes. 6. Retraction of uterus above the head with consequent vertical tension of vaginal wall. 7. Is the child dead or alive, and, if the latter, will its life be jeopardized or lost by the proposed operation. 8. History of former labors (if any) and results of methods then employed. 9. The *number* of previous deliveries, as indicating present labor-power. 10. Imminent danger or actual occurrence of uterine rupture. 11. General condition of woman as regards her ability to survive the proposed operation. 12. The "presentation" and "position" of the child. 13. The existence of complications such as hemorrhage, eclampsia, placenta prævia, prolapsed funis, etc. 14. The estimated knowledge, acquired skill, and native dexterity of the operator, together with (what is not often sufficiently considered) the *kind of hand* he happen to possess, whether small, soft, and pliable, or the reverse.

As much must depend upon whether the child be alive, we may here note the signs of its death.

SIGNS OF FŒTAL DEATH IN UTERO.—Some of these have already been mentioned in the Chapter on "Abortion" (Chapter IX.). Additional ones recognizable during labor are: Cessation of fœtal heart-sounds, after they have been previously recognized; cessation of quickening, especially when immediately preceded by irregular and tumultuous fœtal motions. The discharge of meconium, when the case is *not* a breech presentation, is of some significance. In *head* presentation the scalp is soft and flabby; the cranial bones are loose and movable, and may be felt to grate against, or overlap each other more than usual. No *caput succedaneum* is formed during labor, since there is no circulation in the scalp to produce it. In *breech* cases, the anal sphincter is relaxed and does not contract on the finger. In *face* cases, the lips and tongue are flabby and motionless. In *arm* presentation, the *living* limb is warm, perhaps somewhat livid or swollen from pressure above, and it may be made to move; not so the *dead* arm. In *funis* presentation, the living cord is warm, firm, turgid, and pulsatory; the dead one cold, flaccid, empty, and pulseless. Some of the above signs, it will be evident, can only occur when the child has been dead some time before labor—the condition of the scalp and cranial bones for example.

METHODS OF DELIVERY.—By far the most common, and therefore (to the general practitioner) most important, variety of pelvic deformity is that in which there is simple flattening of slight degree, at superior strait (conjugate of brim measuring between 4 and 3½ inches). Some of these *may* be delivered without artificial aid, provided the pains be strong, the presentation correct, the labor-power not reduced by previous deliveries, and the mechanism follow its normal course, while other conditions are favorable. Should symptoms of "Tedious Labor" supervene (see Chapter XXVIII.), or complications render speedy delivery necessary, the usual mode of assistance is by forceps. Exceptionally, as when head is arrested high up, or above the brim, even in these slighter cases of flattening, version is preferable to forceps, especially when membranes are unbroken and os uteri not sufficiently dilated to render forceps advisable.

In the second degree of simple flattening (conjugate between 3½ and 2¾ inches), we can expect neither spontaneous delivery nor successful forceps delivery, unless the child be *unusually* small. Version is here the most usual mode of proceeding. By turning, we bring the narrow part of the head (its bitemporal diameter, 3¼ inches) to engage *first* in the contracted conjugate, and which the wider *dome* of the skull could *not* do, while, *after* turning, manual abdominal pressure may be applied to the head, and traction on the body added from below. The chief object of version, here, is to deliver a *living* child. If the infant die during version, our design has failed.

Hence, should it be dead already, or very likely to die during version, perforation would be preferable. If a living child cannot pass, it is useless to wait for its death before we perforate. After turning, craniotomy may still be required for the after-coming head, but could this have been anticipated, perforation *before* version would have been better. Many obstetricians do not sanction version at full term, when the conjugate is less than 3 inches. Furthermore, should the head have passed the os uteri, or have descended into the pelvic cavity, or if it require force to lift it back above the brim, or should the uterus be retracted above it (putting the vagina on the stretch), or emptied of liquor amnii and tightly grasping the child's body with imminent danger of rupture: under any of these circumstances version becomes extremely hazardous, and perforation may be preferable; though before this last, a tentative application of forceps is perhaps barely justifiable, for the child's sake, if it yet live. Subjecting the mother to the dangers of an abdominal section, in preference to perforation, for the sake of the child, cannot, in these cases, be favorably considered.

In the third degree of flattening (conjugate of brim between 2¾ and 1¾ inches), forceps and version are out of the question (we still speak of full-term cases). The choice here is between perforation and some form of abdominal section. Should the child be alive, and if it have not been injured by delay or by futile attempts to deliver in other ways, and provided the general condition of the mother, her hygienic surroundings, and capacity to secure skilled attendants, etc., be such as to lend substantial hope of her surviving the abdominal section, this operation would be justifiable—the consent of herself and relatives thereto having been previously obtained. Under opposite circumstances, craniotomy. It must, however, be remembered that contraction of the conjugate below 2½ inches seldom occurs without either *general* contraction, or narrowing of the *transverse* diameter, which must materially influence our mode of proceeding.

When the conjugate of brim is shorter than 1¾ inches, the difficulties and dangers of craniotomy are, beyond all question, greater than those of abdominal section.

In a *generally contracted* pelvis, a *living*, full-term child can scarcely be delivered through the vagina, either by forceps or version, unless the conjugate measure at least 3⅓ inches. With slighter degrees of such contraction, forceps or version may succeed. When the conjugate is 2 inches, but with a transverse of less than 3 inches, Cæsarean section is almost a matter of necessity; and when there is general contraction to the extent of 1 inch in each direction, the abdominal section would *probably* be better than craniotomy.

Should the head, in any case, have descended into the pelvic cavity, or have reached the lower strait, craniotomy would, of course, be less objectionable.

In performing version in extreme *justo-minor* cases, difficulty with the *after-coming head* is often very great. When the general reduction is one inch in *all* the diameters, we can scarcely deliver it even with the perforator and cephalotribe.

Once again, be it distinctly understood that measurements of the pelvis *alone* cannot be taken as guides for practice. In selecting the method of operating, *all* the circumstances of the case must receive due consideration. Exceptional cases recorded in books, of successful delivery through very small pelves, by exceptionably skilled operators, are unique *possibilities*, that cannot be taken as guides for general practice.

In cases where the pelvis will not admit the delivery of a living *full-term* child, the birth of a living infant may still be possible by the induction of premature labor, which is considered in the next chapter.

CHAPTER XXII.

THE INDUCTION OF PREMATURE LABOR.

By the end of the 28th week of pregnancy the child is sufficiently developed to be capable of extra-uterine life. Delivery between the 28th week and full term is called "premature labor:" *before* the 28th week, "abortion."

Cases in which it is Proper to Induce Premature Labor.—1. In pelvic deformity where there is sufficient space for a seven-months' child to be delivered without injury. The object is twofold: (*a*) to save the child's life by obviating the necessity for craniotomy; (*b*) to spare the mother the dangers of craniotomy, Cæsarean section, or other operations that might be required if the pregnancy went to full term. 2. In cases where, in previous labors, the head of the child at full term has been prematurely ossified, or unusually large, so that labor has been difficult and dangerous, even though the pelvis were normal. The period of delivery need only be two or three weeks before "term" in these cases. 3. In cases where the children of previous pregnancies have died *in utero* during the later weeks of gestation from disease (fatty, calcareous, or amyloid degeneration, etc.) of the placenta. 4. In conditions where the continuance of pregnancy seriously endangers the mother's life, such as: excessive vomiting; albuminuria; uremic convulsions, or paralysis; chorea; mania; organic disease of the heart, lungs, liver, bloodvessels, etc., threatening fatal disturbance of the respiration, circulation, and other vital functions; irreducible displacements of uterus; placenta prævia with hemorrhage; and in dangerous pressure upon neighboring organs from over-distention of uterus, due to dropsy of amnion, tumors, multiple pregnancy, etc.

INDUCTION OF PREMATURE LABOR IN PELVIC DEFORMITY.—The degree of conjugate contraction of the pelvis, in which it is proper to induce premature delivery, when it is designed to save the child's life, is practically limited to between 2½ and 3½ inches.

A child, at the end of the seventh lunar month (28th week), may be delivered alive through a conjugate diameter of 2½ (possibly 2¼) inches.

One at the end of the eighth lunar month (32d week) through 3 inches—possibly, through 2¾.

One at the end of the ninth lunar month (36th week) through 3½ inches.

When the measurement is over 3½ inches, the labor may be left till full term (40th week).

Owing to the difficulty of determining *exact* size of the head and pelvis, the more precise rules given in text-books are practically useless. Furthermore, it is not always easy to ascertain with *precision* the duration of pregnancy. The selection of any week, intermediate of the periods above noted, must be left to the judgment of the obstetrician and decided by the circumstances of each case. The most usual time for bringing on labor, all things considered, is between the 32d and 34th week.

In any case, with a conjugate of 2¾ inches, chances of saving child's life are exceedingly small; but as craniotomy and abdominal section are the only other alternatives the attempt ought to be made, delivery being aided, if necessary, by version, or by small forceps—a diminutive instrument having been constructed for this purpose.

When the conjugate diameter measures *less* than 2½ (or 2¼) inches, *abortion* should be induced as soon as possible after the diagnosis of pregnancy is certain. When the conjugate diameter measures 1½ inches, the induction of abortion must not be postponed later than the beginning of sixth month; when 1¼, not later than beginning of the fifth; and when only 1 inch, not later than 4½ months. If, however, the female (being childless, or for other reasons) prefer to risk the dangers of a cutting abdominal operation, and there are no special circumstances rendering such a course peculiarly inadvisable, the case may be allowed to go to term, and the child then extracted promptly by section through the abdomen.

Methods of Inducing Labor Early in Pregnancy before the Child is Viable.—Rupture the amniotic sac by introducing a sound into uterine cavity and turning it about therein, until the liquor amnii escapes. This method is never to be adopted later, when it is designed to save the child's life, for discharge of "waters" subjects soft and immature fœtus to fatal compression from contracting walls of uterus; it also renders version (which may be necessary for delivery) difficult.

Another method: Introduce carbolized sponge or sea-tangle-tent into cervix to dilate the os, and provoke uterine contraction. This method secures preservation of the bag of waters, which aids subsequent dilatation of os and cervix uteri, and favors discharge of entire ovum, membranes, placenta, and fœtus—all at one time.

Best Method of Inducing Premature Labor when it is Designed to Save the Child's Life.—Pass into the uterus, between its wall and the fœtal membranes—with great care and gentleness, to avoid rupture of sac and disturbance of placenta—a male elastic catheter or bougie, to a length of 6 or 8 inches within the os. Let it remain there (kept in place, if necessary, by a sponge placed in the vagina) as a foreign body to invoke uterine contraction. If, in twenty-four hours, no effect be produced (which rarely happens), take it out, and again introduce it in a somewhat different direction, and leave it as before. Uterine contractions eventually occur, when the instrument is removed, and if the pains increase in strength, the case may be left to nature.

If the contractions are only feeble and do not increase in strength and frequency, accelerate both *them*, and dilatation of the os, by introducing elastic dilators (Barnes' water-bags, etc.), first a small one, afterward larger sizes, into the cervix. No other measures will *generally* be required. If, when the os is *well dilated* with the larger bags, uterine contraction be still delayed, the membranes *may* be ruptured.

Other Methods—The Vaginal Douche.—Place the woman upon a bed, her hips near the edge of it and resting on a rubber cloth, in which is arranged a gutter to guide the returning fluid into a vessel on the floor. By means of a fountain-syringe, Davidson's syringe, or a rubber tube connected with an elevated vessel, direct a stream of warm water *against* the cervix uteri, continuously, for fifteen minutes, three times a day, at intervals of six hours. The nozzle of the syringe must go *against* the *neck*, never *into* the *mouth* of the womb. Temperature of the water about 100° F. From four to twelve, or more, injections may be necessary. The woman need not keep her bed before labor begins. A modification of the vaginal injection is known as

Cohen's Method.—This consists in passing an elastic catheter between the membranes and uterine walls, and injecting warm water, slowly, in quantity of seven or eight ounces, *into the uterus*, preferably near the fundus, until the patient feels some distention. Labor comes on much more certainly and rapidly than after the vaginal douche; *but* both these methods have caused sudden death of the female, and Dr. Barnes, with whom many other practitioners agree, avows "that the douche, whether vaginal or intrauterine, ought to be absolutely condemned as a means of inducing labor." Cohen's method, has, however, been highly recommended even recently. Yet as we have a safer one, which has just been described, this risk is needless.

THE VAGINAL TAMPON.—Distending the vagina with a tampon, or rubber bag blown up with air or water through a stopcock (the *colpeurynter* of Braun), is another means of exciting uterine contraction, and a comparatively harmless one when carefully used, but withal painful, and uncertain in efficacy.

THE SPONGE TENT was formerly used to induce labor by mechanically dilating the cervix uteri. It is now seldom resorted to except, where the os is very small, as a preliminary to the introduction of Barnes's elastic dilators, previously mentioned.

The use of ergot and other oxytocics; the injection of carbonic acid gas into the vagina; separation of the membranes from the uterine wall by means of the finger or the uterine sound; the induction of uterine contraction by electricity, galvanism, abdominal frictions, irritation of the mammary glands, have in turn all been resorted to for bringing on premature labor, but cannot now be recommended.

Whatever method is used, the main purpose of the operation, viz., that of saving the child's life, must be kept constantly in view, and since delay after rupture of the membranes, if prolonged, is likely to destroy the child, it should be delivered either by forceps or version as soon as dilatation of the os uteri and other existing conditions render such a proceeding safely practicable.

TREATMENT OF PREMATURE INFANTS AFTER BIRTH.—The two great *desiderata* are warmth and food, to which a third might be added, viz., rest. Lay the child upon a mass of, and cover it over with, cotton-wool. Keep it near the fire, protected from changes of temperature. Handle it carefully in washing, the water used being as warm as 100° F. The mother's milk, given with a spoon if the child be too feeble to suck, must be administered at frequent intervals, and without a long fast during the night.

CHAPTER XXIII.

PLACENTA PRÆVIA — HEMORRHAGE BEFORE AND DURING LABOR.

Placenta prævia consists in implantation of the placenta abnormally near to, or more or less over, the internal os uteri. There are three varieties: (1) The border of the placental disk may be near the margin of the os without overlapping it, hence called "*marginal;*" (2) the placenta may be partially, or (3) completely, over the os internum, hence, respectively, "*partial*" or "*complete*" cases.

Causes.—Not certainly known. Probable explanations are: displacement of ovum from its normal position and lodgement lower down, as after arrest of threatened abortion; abnormally low position of orifices of Fallopian tubes; large relaxed uteri of multiparous women, in which folds of decidua vera do not retain ovule near fundus when it first enters the womb: hence the undoubted greater frequency of placenta prævia in multiparæ.

Consequences of Placenta Prævia.—1. Liability to premature delivery; 2. Tendency to malpresentation; 3. Fearful hemorrhage, generally coming on during the last twelve weeks of pregnancy, or when labor begins; the bleeding being earlier and greater according to the greater degree of placental encroachment over the os; in the marginal cases sometimes not until "term;" in complete ones, exceptionally, *before* the last twelve weeks.

Symptoms and Diagnosis.—*Before labor* sets in, placenta prævia is generally unsuspected until the sudden occurrence of hemorrhage, which begins *without any known cause*, sometimes even at night during sleep. It may stop and again recur. The quantity varies with the amount of placental *separation* (which always precedes the bleeding). First attacks usually moderate; exceptionally, quarts of blood are lost, and death follows one or two recurrences; such cases are usually "*complete*" ones.

During labor the bleeding begins early with commencing dilatation of the os. It may, in marginal cases, be arrested by rupture of membranes and consequent compression of bleeding surface by the presenting head. Labor pains usually feeble, and dilatation slow. To these symptoms must be added those due to blood-loss: syncope, restlessness, feeble pulse, cold extremities, etc. In fatal cases convulsions often precede death.

The *diagnosis*—clearly suspected from history and symptoms—is confirmed by vaginal examination, the irregularly granular spongy texture of the placenta being easily recognized by the finger passed into the os. In some primiparæ passing the finger to or through the internal os may be difficult or impossible; then, however, one side of the lower segment of the uterus may be felt, through the vagina, to be *boggy*, *soft*, and *enlarged* where the placenta is attached; and the pulsation of arteries may be felt in it. A stethoscope applied to cervix may reveal loud placental murmur. The sign ballottement is obscured.

Prognosis.—Extremely grave. Statistical estimates give maternal mortality from 25 to 30 or even 40 per cent. As statistics cover a long period of time, necessarily so from placenta prævia not occurring more frequently than once in 500 or 1000 labors, there is reason to hope that the above rate of mortality has been reduced by *recent* improvements in treatment. The outlook is worse in proportion to the degree in which placenta overlaps the os. Two out of three children are born dead, and still others succumb soon after birth.

Treatment.—The main principle of treatment is *delivery;* there is no safety for the woman until the uterus is emptied. It was formerly the custom, and still is with some obstetricians, when hemorrhage occurs before the twenty-eighth week of pregnancy, to wait, only using palliative measures to check hemorrhage, until the period of viability, before attempting to deliver. This is wrong and always unsafe. The child will seldom be saved by temporizing, and the mother often dies with the recurrence of hemorrhage, the bleeding coming on suddenly, as it is apt to do, in the absence of the physician. The best rule is to *deliver as soon as practicable after the first occurrence of hemorrhage whether the child be viable or not.*

The usual *mode* of delivery is *podalic version*, preferably by the combined internal and external manipulation—the so-called "bipolar" method—and subsequent traction on the feet. Since the issue of the last edition of this work the published results of 178 cases of placenta prævia, by Drs. Lomer, Hofmeier, and others, give a maternal mortality of only four and a half per cent., and an infant mortality of sixty per cent. No other practice has furnished such favorable results. The method is as follows: As soon as the os uteri is sufficiently dilated to admit one or two fingers, pass the whole hand into vagina, insert one or two fingers through the os uteri, and get down one foot by Hicks's bipolar version (described fully in Chapter XVII., pages 202–205). Pull down, successively, the leg, thigh, and breech, which fill the os and cervix uteri, and act as a tampon to stop bleeding. Do *not* at once extract child, but let it come unaided, or assist occasionally, during pains, by gentle traction, so as to deliver in about an hour. With the child's leg for a tampon the disagreeable cotton plug may be dispensed with. If the placenta be in the way, perforate the membranes at its margin, or at any point where it may be separated. Failing in this, plunge the finger through the placenta, and bring down the leg through the opening thus made.

Before the os uteri is sufficiently dilated to admit the fingers (as may occur often enough when the labor is premature, especially in primiparæ), and while waiting for dilatation, and to prevent meanwhile a fatal hemorrhage, the several means at our command are: *vaginal tampon, uterine dilators, ergot, rupture of membranes,* and *partial digital separation of placenta,* the selection of one or more of these means to depend upon the kind of case under treatment, as defined below.

In cases where the uterine neck is long and narrow, and the os small, put a sponge tent (carbolized), or a Barnes's dilator into the cervix uteri, and pack vagina with tampon. While formerly rupture of the membranes and ergot were not advised thus early, some noted authorities are now disposed to recommend rupture of the membranes in *all* cases of placenta prævia. But this rule is not universally admitted. The purpose, in rupturing the sac, is to stimulate uterine contraction, and cause the presenting part to press down upon the placenta and stop bleeding, which is further promoted by ergot, manual pressure upon the fundus, and an abdominal binder. If tampon be used, it should be removed in five or six hours, or in three or four if the pains are strong enough to lend hope that dilatation of the os is progressing rapidly, a second tampon having been previously prepared for use, if needed. Bipolar version can be done when the os is as small as a silver *half* dollar, or even less, for the tissues of the cervix are unusually dilatable in placenta prævia, and in many cases the child is small—being premature. High authorities advise to proceed boldly with *delivery* when the *external* os is the size of a silver half dollar, for the cervix and *internal* os are still larger and stretch with great facility.

In transverse presentations—not infrequently associated with placenta prævia—podalic version by external or bipolar manipulation should be accomplished before membranes are ruptured or ergot given.

In cases with hemorrhage, before labor begins, the dilators and tampon, used to stop bleeding, will excite pains and bring on labor.

In a few cases (usually multiparæ at or near full term) when the os is pretty well dilated, and the placenta prævia is only partial, and pains are strong, simple rupture of the membranes, with ergot, may be all that is necessary to stop hemorrhage, and the labor will proceed by itself, or (in head presentation) be expedited, if necessary, by forceps.

Besides the means already noted to stop bleeding while waiting for dilatation, there remains to be considered—

Partial Digital Separation of the Placenta, which consists in passing the *hand* into the *vagina,* and one or two *fingers* as far as they will reach into the *uterus.* The fingers, then insinuated between the placenta and the uterine wall, are swept round in a circle so as to *complete* the separation of that part of the placenta attached near the cervix, and whose incomplete detachment keeps the bleeding vessels open. It is often followed by retraction of the cervix and cessation of the hemorrhage, and is especially serviceable when the placenta is placed *entirely* over the os. Rapid expansion of the cervix with Barnes's dilators and delivery by version may follow, if desired; or, there being no necessity for active interference, the case may complete itself without further assistance.

Simpson's method of treating placenta prævia consisted in completely separating and extracting the placenta, trusting to powerful uterine contraction for subsequent rapid delivery of the child, a trust so seldom realized in practice that Simpson's plan scarcely allows a chance for the child's life. Complete separation of the placenta, however, will often arrest the hemorrhage, and may, therefore, be of use when the child is dead, or not viable, or pretty sure to die from prematurity of the labor: or when great exhaustion on the part of the female, and the state of her pelvis and soft parts, contraindicate delivery by version.

No precise rules can be laid down for the exact treatment of placenta prævia in every case. The main difficulties, dangers, and principles of management having been learned and the several methods of treatment enumerated, the rest must depend upon the judgment, skill, and self-possession of the accoucheur.

After delivery ergot must be given, and for several days, to prevent post-partal hemorrhage; and a 2 per cent. solution of carbolic acid should be injected into the vagina twice a day to prevent septic infection. Should bleeding recur, from the low segment of the uterus, when the body of the organ is well contracted, the bleeding surface may be swabbed with a solution of styptic iron, through a speculum.

HEMORRHAGE BEFORE DELIVERY, BUT WITHOUT PLACENTA PRÆVIA.—Partial separation of the placenta, with hemorrhage, may occur during the later months of pregnancy, or after labor has begun, when the organ is *normally situated*. It may result from blows, falls, or other mechanical violence; pathological degeneration of the placenta or utero-placental junction; profound anemia, albuminuria, and multiparity with frequent childbearing are probable predisposing causes. Seldom occurs in primiparæ.

Symptoms.—Flow of blood from the uterus; *pure* blood when it comes from between uterine wall and unbroken membranes; blood *mixed* with liquor amnii when the membranes are broken. Hemorrhage (coupled with alarming syncope, collapse, etc.) may, however, take place inside the womb without appearing externally, as, *ex. gr.*, when the presenting head sufficiently plugs the os uteri; when effused blood accumulates between uterine wall and middle part of the placenta, the placental circumference remaining unseparated; when the blood flows into the amniotic sac through a rupture of the membranes near the placenta; and when it accumulates between the womb and membranes near the fundus.

Other symptoms are: excessive pain, like flatulent colic, distention and irregular bulging of the uterine wall; labor pains may be absent altogether, or, if present, are irregular, feeble, and inefficient. The collapse, pain, etc., occurring during labor, have been mistaken for rupture of the uterus. The latter, however, will be accompanied with recession, or mobility of the presenting part, and escape of the child, wholly or partially, into the abdominal cavity. Rupture is usually preceded by *violent* uterine contractions.

Prognosis.—Extremely grave, especially in concealed cases where the diagnosis is (or may be) uncertain, and efficient treatment postponed. The maternal death-rate is, roughly, about 50 per cent., the infant mortality 95 per cent. Luckily the accident is not a common occurrence, though it is perhaps sometimes undiscovered.

Treatment.—Stimulate *uterine contraction* by every known means. Rupture the membranes at once; give ergot, or ergotin hypodermically; apply uterine compression by firm abdominal binder.

If os be dilated, deliver by version, or, if during labor the head be low enough, by forceps. If the os be *not* dilated, dilate it with Barnes's bags, until sufficiently open to admit of version, extraction of the child being assisted by manual abdominal pressure.

CHAPTER XXIV.

POST-PARTAL HEMORRHAGE—"FLOODING."

HEMORRHAGE after delivery of the *child*, and either before or after delivery of the *placenta*, is a most dangerous complication, sometimes causing death in a few minutes, especially when unprepared for, and irresolutely managed. Hence necessity of fixed principles and decided remedies, used without hesitation, in the hour of need. Dr. Gooch well said: "No physician should have the assurance and hardihood to cross the threshold of a lying-in-chamber who is not thoroughly conversant with the remedies for flooding." It consists of bleeding from the open mouths of uterine blood-channels from which the placenta has, wholly or in part, been separated.

Causes.—Correctly appreciating the causes of flooding permits *prevention*, which is better than cure. Excluding, for the present, the rarer cases in which bleeding occurs from laceration of the uterus, vagina, and vulva, the one condition, above all others, that leads to flooding is *deficient uterine contraction*—sometimes a *total* want of it—*inertia uteri.* Why should the womb remain inert after the child is born? Its muscular walls may be worn out by a *long labor;* or partially paralyzed (like an over-full bladder) from previous *overdistention* due to amniotic dropsy, or plural pregnancy, etc. Too *rapid labor*, as by injudicious haste in artificial delivery, or from abnormally enlarged pelvis, especially when preceded by overdistention of the womb, produces it. The uterine muscular walls may be congenitally *deficient in development* (as in precocious mothers), or *malformed*, or bound down on the outside by *peritonitic adhesions*, or *texturally degenerated* from previous inflammation, or *numerous and quickly successive labors*, as in elderly women. Weak uterine muscles may occur from *general weakness of the female*, due to constitutional disease, severe previous illness, exhausting discharges, heat of climate, etc.

Distention of bladder or *rectum* causes *sympathetic* uterine inertia, as may also *violent mental emotion.*

Retention of placenta—whether from morbid adhesion, large size of the organ, or irregular ("hour-glass") contraction of the womb—*mechanically* prevents close contractile approximation of the uterine walls. In the case of morbid placental adhesion, the *partially separated* blood-channels are kept open and *cannot retract* to prevent bleeding, as they normally should do.

Those who have flooded in previous labors are apt to flood again. This is observed in plethoric women, subject to profuse menstruation, and is further explicable by existence of conditions as to pelvis, womb, etc., previously mentioned, which are permanent and irremovable.

Further causes are: conditions which interfere with formation of, or which tend to move and displace, coagula in the mouths of the bleeding vessels. The blood changes of profound albuminuria, and wasting diseases, possibly the so-called "hemorrhagic diathesis," may retard formation of coagula; and formed or half-formed clots may be displaced by strong arterial tension and pulsation, or by the patient suddenly rising, "sneezing, coughing, laughing, vomiting," etc. (Lusk.)

On the whole, the one main cause is *deficient uterine contraction.* When a contracted womb continues to bleed, there is probably laceration.

Symptoms.—Gushing of blood from the vagina, either immediately or some time after birth of child, or still later after delivery of placenta. Quantity variable: moderate or fatal—a trickle or a flood. Absence, partial or complete, of hard uterine globe on hypogastric palpation. The womb may be soft and greatly enlarged from accumulation of blood in its cavity, with little or no external flow ("concealed hemorrhage"). In either case there are symptoms of blood-loss: deathly pallor; cold extremities; feeble, frequent, thready or imperceptible pulse; gaping, restlessness, dyspnœa, and hunger for air; thirst, and even hunger for food, In the worst cases syncope, loss of vision, convulsions, death.

Treatment. Preventive and Preparatory Measures.—The necessity of guarding against relaxation of the uterus and promoting uterine contraction during the third, and near the end of the second stage of labor—by manual pressure—has already been insisted upon as a precaution in every case. Prof. Lusk, in his recently published work, advises every obstetrician to prepare for flooding during second stage of labor—whether it be likely to occur or not—by providing beforehand a good working Davidson syringe, ice, brandy, ether, perchloride of iron, morphia, a hypodermic syringe *ready filled* with aqueous fluid extract of ergot, basins of hot and of cold water, a bed-pan, carbolic acid, ergot, etc., all placed within easy reach of the bedside, a preparation neither tedious nor troublesome, but which may save a life.[1]

When the hemorrhage occurs, inject a drachm of fluid extract of ergot, or two grains of ergotin in a drachm of water, into the outside of the thigh. Let an attendant give another dose by the mouth. Then pass one hand, without delay, into the uterine cavity, while the other compresses and manipulates (by kneading and friction) the fundus, to provoke contraction. *If the placenta be undelivered,* it must be removed at once, either by grasping and squeezing the fundus firmly

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[1] It is hoped the recommendations of Dr. Lusk may contribute to lessen the frequency of the appalling deaths from flooding, many of which may be attributable to lack of previous preparation. It has long been the author's opinion, as already expressed on a former page, that some such preparation should be *required* of physicians by legal enactment.

by the outside hand; or the hand inside grasps the placenta bodily, having previously separated any remaining adhesions, and gently withdraws it, the hand outside meanwhile compressing the uterus with sufficient firmness to squeeze its anterior and posterior walls together. *If the placenta be delivered* before the flooding, and large blood-clots occupy the cavity, these must be fearlessly removed, and the obstetrician's hand takes their place; at the same time a piece of ice, as large as an egg, may be passed in with the hand and moved about over the surface of the uterine cavity. A special mode of grasping the uterus—bimanual manipulation—may be tried as follows: Press the finger-ends of the outside hand deep in between the umbilicus and fundal tumor, so that the latter resting in the palm may be pushed down and forward against the pubes, while the other hand (or two fingers of it), passed high up along the posterior vaginal wall, presses the lower segment of the womb—in fact, its cervix—forward toward the symphysis pubis, thus by a sort of temporary anteflexion the canal of the neck is closed and no blood can come out, while the pressure above prevents enlargement of cavity and accumulation within. It also stimulates contraction.

A rolled, gashed lemon, or a small sponge filled with vinegar, passed into the womb, and squeezed so that their respective juices come in contact with uterine walls, are also efficient stimuli to contraction. And another good one is irrigation of the uterine cavity with *hot* water (110°–120° F.) by means of a Davidson syringe, care being taken that the instrument is completely emptied of air before being used; a bed-pan receives the returning water.

In every case the child, whether washed or not, may be put to the breast, by an assistant, in the hope that suction of the nipples will produce reflex uterine contraction.

Contraction may sometimes be induced by rolling a piece of ice on the abdomen over the fundus at intervals, or pouring cold water from a height upon it, or flapping it with a wet towel, or injecting ice water into the rectum, or vagina, or even into the uterus; this last, however, is not so good as the hot water previously mentioned.

Should all means thus far referred to fail, the last resorts are: injecting the uterine cavity, or swabbing it by a sponge probang, with liq. ferri perchlor. (or liq. fer. persulph.) one part to five parts of water. This constringes the mouths of the bleeding vessels, coagulates the blood in them, and stimulates uterine contraction. The remedy is not without danger to life, but is justifiable when other means have failed. Tincture of iodine, one part to three of water, has been used in the same manner.

Dr. Barnes insists that the dangers of injecting uterus with styptic iron solutions will be prevented, if the following rules be followed in using it: (1) be sure that uterus is empty of placenta, blood, and clots; (2) compress body of uterus, during injection, with the hand; (3) have two basins ready, one containing hot water (with which womb is first washed out) and another containing the iron solution (which immediately follows the hot water). Inject seven or eight ounces of the iron solution, slowly and gently, all the time keeping up steady pressure on fundus uteri. Dr. Barnes's formulæ are as follows:

℞. Solid ferric chlorid. ℥j.
Aqua, ℥x. M.

or

℞. Liq. ferri perchlor. fortior (Ph. Br.), ℥iss.
Aqua, ℥viiiss. M.

He advises womb to be washed out daily with carbolic injections afterward, to prevent septicæmia.

Compression of the abdominal aorta has been employed with good result as a temporary measure in urgent cases. It cuts off the blood supply to the flooding uterus, stimulates uterine contraction, and lessens risk of fatal syncope by keeping blood in the brain that would otherwise flow downward.

Under no circumstances should a vaginal tampon be used. It would cause the uncontracted empty womb to fill up with blood, thus converting an external hemorrhage into an internal, "concealed" one, and enlarging instead of diminishing the uterine cavity.

In all cases it should be ascertained that inertia of the womb is not kept up by a full bladder or rectum.

To restore the circulation after hemorrhage has ceased, or to prevent impending fatal syncope during its continuance, stimulants, nutrients, and opiates are required. A drachm of brandy, whiskey, or sulphuric ether may be given hypodermically, and repeated at required intervals; morphia hypodermically to promote cerebral congestion, and tincture of opium and brandy internally in full doses, together with strong beef *essence*, milk, etc., at short intervals. If vomiting occur, opiates, stimulating and nutrient enemata, or hypodermic injections, may be used to the temporary exclusion of mouth-feeding. Admit plenty of fresh air from open windows. Remove all pillows to keep the head low, and elevate the foot of the bed, thus promoting gravitation of blood to the brain and medulla. The head must not be raised from its dependent position, to give food or medicine, nor for any other purpose, for fear of syncope and *fatal heart-clot,* until reaction has taken place.

Compression of the brachial and femoral arteries—or binding the four extremities with Esmarch's bandages—like aortic compression—may keep enough blood in the brain, temporarily, to prevent death, while stimulants get time to act.

Transfusion of blood; intravenous injection of *fresh* cow's milk, and of saline solution, are last resorts when other remedies fail. Milk, as advised by Prof. Thomas, is most available. Half a pint may be passed into a vein in the arm, by means of an elevated funnel from which depends a tube surmounted at its lower end by a small canula for penetrating the opened vein. The tube and canula must contain no bubble of air.

Instead of milk, the following saline solution may be used, as much as a quart being slowly introduced into the vein:

℞. Sod. chlorid. ʒiss.
Sod. bicarb. gr. xv.
Aqua destillat. Oij. M.

It should be heated to about 100° Fahr., and twenty or thirty minutes occupied in injecting it. The best and safest instrument is that of Collin.

After reaction has been established, the woman will suffer, perhaps for several days, with neuralgic headache, and photophobia, due to cerebral anemia, hence iron, quinine, and nutritious diet will be required.

Secondary Post-partal Hemorrhage (Puerperal, or Remote Hemorrhage) may occur within three or four days, or even as many weeks, after labor. Its *causes* are: retained blood-clots, membranes, or pieces of placenta, or (perhaps unsuspected) a placenta succenturia, in the uterus. It may also arise from violent mental emotion, or physical exertion, or use of alcoholic stimulants soon after labor. Fecal accumulation; retroflexion of the womb; laceration of the cervix; inversion; thrombus of cervix or vulva; fibroid and polypoid tumors; and certain blood changes, such as those of profound anemia, albuminuria, or miasmatic poisoning, are additional causes. One case, occurring eight days after labor, followed the inhalation of chloroform and aconite, for insomnia. *Symptoms:* Bleeding may come on suddenly (quantity variable), stop, and recur at intervals. It may, or may not, be accompanied by fetid discharges, and septicæmic symptoms. *Treatment* depends upon cause, which must be thoroughly investigated. In case of retained clots or secundines, remove them by finger, or blunt curette, swab uterine cavity with tincture of iodine, and give ergot with tinct. cannabis Indica gtt. xv every six hours. If septicæmic symptoms, carbolized injections to uterine cavity, with care to insure their immediate return. Retroflexion will require replacement and a full-sized Hodge pessary. The inverted womb must, if possible, be replaced, or astringent washes applied to the bleeding surface in case of failure. In any case, absolute rest and mental quietude, with tonics and nutritious liquid diet, as a matter of course. In case of *alarming* secondary hemorrhage, the tampon has been suggested. It is a dangerous remedy so long as the womb is liable to dilate, above it, with accumulated blood; but less so the longer the period since delivery. If used at all, it must be conjoined with compress and bandage over abdomen, to prevent uterine dilatation. Other plans of treatment will be suggested by the remaining causes before mentioned.

MORBID RETENTION OF THE PLACENTA, from causes other than inertia uteri, has been referred to as an additional factor in the production of post-partal hemorrhage. It is commonly due to *morbid adhesion* of the placenta to the uterine wall, in consequence of placentitis, or inflammation of the utero-placental junction, having taken place during pregnancy; or there may have been chronic inflammation of the lining of the womb (endometritis), with hyperplasia of connective tissue, before impregnation. Abnormal placental adhesion is often associated with, and is indeed a cause of, *irregular "hour-*

glass" contraction of the uterus, which consists in a spasmodic contraction of some of the circular muscular fibres of the womb near its middle, the placenta being retained above the constriction, through which last the umbilical cord may be traced up from the os externum.

Spasmodic contraction of the os is another condition by which delivery of the placenta may be delayed.

Treatment.—Spasm of the os, and spasm of the circular fibres higher up, may both be overcome by *steady continuous pressure* with the hand, the finger-ends being approximated into a cone, or one finger put in at a time until all have entered, when the hand may be gradually forced through the constriction, counter-pressure being always made by the other hand upon the fundus. The placenta is then, if *not* adherent, simply grasped by the hand and gently withdrawn during a contraction of the uterus, aid being afforded by pressure on the fundus, and by ergot. If the organ *be* adherent, the morbid adhesion must be broken up, and the placenta completely separated before withdrawal is attempted. A finger—one or two—must be insinuated between the uterus and placenta at some point already partially separated, or, if no partial separation exist, at a point where the placental border is thick, and then passed to and fro, transversely through the utero-placental junction, acting like a sort of blunt "paper-knife," until separation is complete. Another mode is to find, or make, a margin of separation as before, and then peel up the placenta with the finger-ends, rolling the separated portion toward the hand-palm upon the surface of the still adherent part, as one might lift up the edge of a buckwheat cake and roll it upon itself until it were turned completely over and separated from the plate on which it lay. Strong fibrous, or fibro-cartilaginous, rarely, even partially ossified bands, may require to be pinched in two between the thumb-nail and index finger. Great care is necessary to avoid peeling up an oblique layer of uterine muscular fibre, which might split deeper and deeper until leading the finger-ends through the uterine wall into the peritoneal cavity. Should such a splitting begin, leave it alone and recommence the separation at some other point on the placental margin. It is sometimes only possible to get the placenta away in pieces. These should be afterward put together and examined to indicate what remnants are left behind. It may be quite impracticable to get out every bit, but small remnants, or thin layers too firmly adherent for removal, do not distend the womb enough to create hemorrhage from their bulk, and the subsequent danger of septicæmia from their decomposition may be obviated by injecting warm (two per cent.) carbolized water into the uterus, twice daily, until everything has come away.

In cases where the placenta is retained from its *unusually large size,* hook down one edge of it with the fingers to insure its presenting endways instead of flat like a button buttoned in a button-hole, and then make downward and *backward* traction—aided by ergot and abdominal pressure—to draw it through the os uteri. To make the *backward* traction referred to, dig one or two finger-ends into the substance of the placenta, if it cannot be grasped firmly enough by the finger ends, and manipulate as if attempting to *push it toward the sacrum.* A part of the organ having thus been made to bulge out of the os, release the fingers and hook them into the placenta again, higher up, and so on until it has entirely passed into the vagina.

When, in extracting placenta, artificially, the hand has been introduced into womb, the latter should be washed out afterward with a carbolic solution.

Introducing the hand into the *vagina* for extraction of the placenta is sometimes sufficiently painful to cause objection and resistance on the part of the female, the vulvar orifice being tender or perhaps more or less lacerated. A little firmness of purpose, sometimes lacking in the young practitioner, coupled with moral encouragement of the woman, and gentleness of manipulation, will remedy the difficulty.

CHAPTER XXV.

INVERSION OF THE UTERUS.

THE womb may be inverted in various degrees, from a simple indentation of the fundus, to its being turned completely "wrong side outward," and hanging in the vagina. It usually begins by "*depression*" of the fundus, the top of the uterus being indented like the bottom of an old-fashioned black bottle; this may go on until the fundus reaches and begins to protrude through the os into the vagina ("*partial inversion*"), or the protruding part may come through more and more, until the whole organ is turned inside out ("*complete inversion*").

Occasionally inversion begins at the neck, the fundus being then inverted last.

Causes.—Under any circumstances inversion of the uterus is rare, but it is usually the result of mismanagement—traction on the cord, or upon an unseparated adherent placenta, during the third stage of labor, especially when the womb is not well contracted. Other causes are: an *actually* short umbilical cord, or one that is *practically* short from coiling round the child; sudden delivery, particularly while standing, and when the uterus is over-distended and relaxed; violent straining, or coughing efforts after delivery; forcible and injudicious pressure upon the fundus from above, whether by the hand, or heavy compresses. In short, a relaxed womb may be inverted either by pressure from above, or by traction from below.

A very few cases have occurred after abortion, and in unimpregnated uteri with polypi whose pedicles were attached near the fundus, but these last belong to gynæcology.

Symptoms.—Hemorrhage, faintness, shock, pain, vesical and rectal tenesmus. Abdominal palpation reveals "depression" of fundus, and bimanual examination, in "partial" and "complete" inversion, demonstrates respectively partial or complete absence of uterus from its normal position in the pelvis. Vaginal examination discovers uterine tumor occupying the vagina, together with the placenta, if this last have not been previously delivered.

A fibrous polypus (the only thing liable to be confounded with an inverted womb) may be diagnosticated from the uterus by its *complete insensibility*, its *total want of contraction when handled*, and by *following its pedicle through the os uteri up into the uninverted uterine cavity*, which last may, in any case of doubt, be demonstrated with the *uterine sound.* Feeling the fundal tumor of the womb in its proper position, through the abdominal wall shows the organ is not inverted. Uterine inversion is hardly likely to be mistaken for polypus, except when the organ remains inverted for months (sometimes for years) after labor, becoming reduced in size by involution; such cases are called "chronic inversion," and properly belong to gynæcology.

The *prognosis* of uterine inversion during labor is always serious. The great immediate danger is profuse hemorrhage, the *more* profuse when associated with inertia uteri, and perhaps some spasm of the os. Much depends upon the early reduction of the inversion. Every minute adds to both danger and difficulty. Exceptionally, the placenta may be sufficiently adherent to prevent great hemorrhage.

Treatment.—"Depression" of the fundus, and "partial" inversion may be readily reduced, by passing the hand into the womb and pushing out the indented portion, while the organ is then stimulated to contract.

When inversion is "complete," reduction may still be easy, if attempted at once, but not so after delay. If the placenta be still wholly or in great part adherent, it should be attempted to push it back with the uterus, the closed fist being pressed against the dependent fundus on which the placenta forms a cushion, while counter-pressure is made with the other hand over the abdomen. When the bulk of the placenta interferes with reduction, and when it is already in great part detached from the womb, its separation may be completed before pushing back the fundus. When constriction of the os, and other causes, have produced swelling and congestion of the inverted uterine body, the latter must be compressed between the two hands steadily for a few moments to lessen its bulk before reduction is attempted.

Should spasmodic constriction of the os render reduction impossible even by steady, firm pressure, anæsthesia may be resorted to, to relax the spasm.

After reduction, the hand must not be withdrawn from the uterine cavity, until the organ has been made to contract, and the placenta, if pushed back with the womb, must then be separated and withdrawn as in other cases.

When the dependent inverted fundus refuses to yield readily to manual pressure, one or both of the angles of the womb, where the Fallopian tubes enter, may be first indented in the operation of reduction.

CHAPTER XXVI.

RUPTURE OF THE UTERUS, VAGINA, ETC.

RUPTURE OF THE UTERUS may occur in any *direction*, transversely, longitudinally, or both; in any *position*, fundus, body, or neck, most frequently toward the last; and in various *degrees*—that is, through the muscular wall without rupture of the peritoneum, or through both peritoneal and muscular coats.

Causes.—Strong uterine contraction coupled with mechanical impediment to passage of child—conditions existing in transverse presentations, pelvic deformity, or contraction, and with large size of the fœtus, especially of the fœtal head, as in hydrocephalus. The powerful contractions produced by a too early and injudicious use of *ergot.* Multiparity, and thinning of the uterine walls due to frequent childbearing, are predisposing causes. Anteflexion, anteversion, cervical obstruction, and lateral obliquity of the uterus, constitute other instances of mechanical hindrance to labor liable to be attended with rupture. The womb may be ruptured by violent and unskilful manipulations during version and forceps operations. Inflammatory changes in the uterine tissues, due to prolonged pressure between the fœtus and pelvic walls, conduce to rupture—even ulceration and gangrene may occur. Rupture may occur also from blows, falls, or other mechanical injury.

Symptoms.—Although rupture generally occurs suddenly, and without warning, the existence of conditions mentioned under the head of "causes" ought to be sufficient to indicate danger of the accident. In certain cases of mechanical obstruction to delivery, where the cervix uteri is tremendously stretched, and powerful contractions draw the fundus and body of the uterus, as it were, upward, and off the child when the latter refuses to descend, the line or furrow of division between the thickened *body* of the uterus, and the thin distended *neck* may be felt through the abdominal wall by palpation. Action and reaction are equal and in opposite directions, hence, during powerful uterine contraction, if the child will not *descend*, the body and fundus of the womb will *ascend*, thus the *round ligaments* of the uterus are put upon the stretch, and can sometimes be felt as *tense cords* by abdominal palpation. The *vaginal* wall may also be tense and stretched. Such conditions indicate danger of rupture, and may be set down as *premonitory symptoms*.

When rupture actually occurs, the typical symptoms are: a sudden sharp pain in the womb (caused by its tearing), often accompanied by a snapping noise audible at some distance from the patient; sudden and simultaneous cessation of labor pains (a bursted uterus can no longer perform its function of contraction); a sensation as if warm fluid (really blood) were being diffused into abdomen; violent shock and collapse, indicated by pallor, feeble and frequent pulse, cold extremities, fainting, hurried respiration, vomiting, etc. (usually due to hemorrhage into the peritoneal cavity). On *vaginal examination*, the presenting part of the child is found to have receded from its former situation, owing to partial or complete escape of the fœtus through the rent into the abdominal cavity, where, by *abdominal palpation*, it may be felt as an irregularly shaped tumor, more or less distinct from another tumor formed by the partially contracted uterus. Blood may or may not escape from the vagina. A loop of intestine may prolapse through the rent and be found by vaginal examination.

The foregoing array of symptoms would leave no room for doubt in diagnosis. But when rupture takes place more gradually or is incomplete, and not accompanied by even partial escape of the child into the abdominal cavity, the symptoms are less decided. There may be no recession of the presenting part, no sudden excruciating pain, and uterine contraction may continue. Here the diagnosis is necessarily obscure. But there is usually bleeding into the peritoneal cavity, hence symptoms of *collapse, a feeble and frequent pulse*, etc., coming on more or less suddenly and otherwise unaccounted for. In a gradually progressive rupture, labor pains may continue, and force the child *gradually* through the enlarging rent. Accumulating blood may sometimes be felt as a doughy mass through the abdominal wall.

Prognosis.—It must be understood that rupture (laceration) of the *vaginal portion* of the cervix uteri may, and frequently does, occur during labor without any necessary immediate danger to life; but in these the tearing does *not* involve the peritoneum and escape of blood, etc., into the abdominal cavity.

Rupture involving any portion of the womb *above* the vaginal part of the cervix is a different affair. The prognosis is here most grave. Death may ensue rapidly, either from profound shock or hemorrhage into the peritoneum, or, surviving these dangers, fatal peritonitis and septicæmia may shortly follow. The maternal mortality much depends upon the severity of the case, the extent of rupture, and the treatment adopted. Formerly it was stated only one out of six cases survived, but by the timely performance of laparotomy the results have become so much more favorable that over half the women are saved. The fœtal mortality is still greater, survival of the child being a rare exception.

Treatment.—Before the occurrence of rupture, but when existing conditions indicate an evident liability to the accident, every means of prevention must be adopted. Though good may be done in certain cases by the rectification of malpresentations, uterine obliquities and flexions, still the main prophylactic resort is *delivery*, either by forceps, version, craniotomy, or whatever other method the circumstances of the case require or will admit. Whatever method is adopted, extra care is necessary to avoid violence of manipulation, particularly when version is attempted. The thin distended lower segment of the womb may be easily ruptured even by moderately violent manipulations, and in cases where the child is dead, craniotomy and embryotomy should be resorted to, by preference, notwithstanding sufficient amplitude of the pelvis to admit of version being performed.

After rupture has occurred, especially if it be at all extensive, whatever is to be done had best be done quickly. There must be no delay. The results of modern practice and the weight of professional opinions have of late strongly tended to the conclusion that *laparotomy* (cutting through the abdominal wall and taking out the child, blood-clots, etc., through the incision) should be at once performed *in all cases of extensive uterine rupture.* Such a rule, however, has not yet been finally adopted.

The child should certainly be delivered, without delay, in all cases. This rule *is* invariable. The *mode* of its removal is the difficult point to be decided in a special case. In this decision but little value must be accorded to the life of the child. It will generally die. Should craniotomy or cephalotripsy, therefore, appear to afford the speediest method of delivery, they may be employed, even though the child still live, and though it were possible, with a little more delay, to extract it by version or forceps. Delivery, however, through the natural passages *must not be attempted* by any operation, when the child has entirely, or in a great measure, escaped through the rupture into the cavity of the abdomen. Then laparotomy is, without question, the preferable resort.[1]

When, on the other hand, the child has not escaped; when the os uteri is dilated and the head presents; and when there is no mechanical obstacle to rapid delivery by forceps, this instrument may be applied. If necessary, and the proper instruments are obtainable without delay, perforation of the skull may precede forceps. In other cases, when the child still remains in the womb, but delivery by forceps is not likely to be rapidly successful, the main resort is version by the feet. Even when part of the child *has* escaped into the abdomen, provided it be not too great a part, version may still be performed. The utmost care is necessary to avoid enlarging the rupture and pulling down a loop of intestine, and when the child is delivered, extreme caution is required in delivering the placenta. The ruptured womb will not expel this last spontaneously. The hand must be passed into the uterus for its withdrawal, as in other cases. If the placenta have escaped through the rent (which is unusual when the *child* has not done so), traction may be made on the cord to bring it near, or into the tear, so that the hand in the uterus may get hold of it without the necessity of passing the hand through the rent into the abdominal cavity.

Subsequent Treatment.—Stimulants to counteract shock and collapse from hemorrhage. Opiates to relieve pain. A drainage tube passed into the uterus, and penetrating half an inch through the rupture, its lower end stitched with silk to the posterior commissure of the vulva, and covered with antiseptic cotton, has recently been recommended to promote discharge of retained septic fluids. After two or three days, when inflammatory adhesions have sufficiently closed any communicating channel between the uterine and peritoneal cavities, antiseptic solutions of carbolic acid (two per cent.) may be used for irrigating the cavity of the womb and preventing septic infection.

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[1] For the mode of its performance, see "Cutting Operations upon the Mother," Chapter XIX.

RUPTURE (LACERATION) OF THE VAGINAL PORTION OF THE CERVIX UTERI.—Slight superficial lacerations are very common, and often unrecognized. Even considerable ones pass unnoticed by the obstetrician more frequently than they would if properly sought for, as they should be after labor is over. Occasionally they extend up to the utero-vaginal junction, or into the vaginal wall. Sometimes transverse in direction (though generally longitudinal); pieces of the os may hang downward in the vagina, and rarely an entire ring of the vaginal cervix may be separated.

Causes.—Distention by the presenting part of the child during labor; rough manipulations during version, forceps, and other operations; incarceration of the anterior lip of the os between the head and pelvis.

Tissue changes preventing dilatation of the os, and primiparity, especially in elderly women, are predisposing causes.

Symptoms.—Hemorrhage, more or less profuse, according to the extent of laceration, the latter to be diagnosticated by digital examination, or, if necessary, by ocular inspection with speculum.

Treatment.— Slight lacerations get well rapidly without treatment. In more severe ones hemorrhage may be controlled by application of solution of persulphate or perchloride of iron on cotton plugs. Recently the practice of uniting extensive lacerations with silver rutures has been adopted with good results; it prevents the subsequent occurrence of congestion, inflammation, and hypertrophy, etc., of the cervix, which may require restoration of the laceration by sutures, etc., months or years afterward.

Carbolized injections into the vagina for a few days after labor when laceration exists, should always be employed to prevent absorption of septic matter by the raw surfaces.

LACERATIONS OF THE VAGINA ITSELF, OR OF THE VAGINAL ORIFICE, are recognized by digital examination or inspection. Extensive ones should be united by silver sutures at once. Small ones require only antiseptic cleanliness, and remedies for hemorrhage, should any occur.

RUPTURE OF THE TISSUES OF THE VULVA—of their inner tissues and bloodvessels—without any necessary laceration of skin or mucous membrane—may occur either during or after labor. Blood is immediately extravasated, causing the labium to swell rapidly, and constituting

THROMBUS OF THE VULVA.—A tumor—bluish in color, elastic or fluctuating, accompanied by sharp pain, usually on one side—forms rapidly, sometimes of sufficient size to prevent delivery mechanically. It may burst and lead to profuse or even fatal external hemorrhage. Extravasation may extend upward outside the vaginal wall to the uterus, or even to the cellular tissue of the iliac fossa, or behind the peritoneum to the kidneys.

The *prognosis* is variable, according to the extent of the injury and extravasation. Death may result from hemorrhage, or from decomposition of retained clots and septicæmia. In many cases, of moderate extent, absorption of the effused blood and recovery take place.

Treatment.—During labor, delivery should be hastened, preferably by forceps, and this *early*—before the thrombus has had time to grow very large. If its size prevent delivery the tumor must be incised, the clots turned out, subsequent hemorrhage controlled by compression, or pledgets of cotton containing solution of perchloride of iron, and delivery by forceps rapidly completed. After labor, when the thrombus has been opened, artificially or otherwise, styptics and compression may still be required to prevent further bleeding. If delivery have been completed without opening the tumor, it must be left alone for absorption to take place. Should suppuration occur, as sometimes happens in a few days, the part must be incised to give exit to pus and clots, and antiseptic treatment of the wound adopted to prevent septic infection. In all cases absolute rest in the recumbent posture and the avoidance of straining efforts of every kind are indispensable, to prevent recurrence of hemorrhage. The bleeding (or extravasation) may also be controlled by vaginal hydrostatic pressure, an elastic rubber bag, or Barnes's dilator, filled with ice water, being introduced into the vaginal canal, for a few hours subsequent to delivery. Carbolized washes to be used after its removal.

RUPTURE OF THE PERINEUM.—Causes and mode of prevention of this accident during labor have already been considered. (See Chapter XI.)

Every woman ought to be carefully examined after delivery, and preferably by inspection of the parts, to ascertain if perineal laceration exist.

Slight fissures of the posterior commissure, or of the fourchette in primiparæ, usually heal of themselves without treatment. Extra antiseptic cleanliness is, however, advisable. Even tears of apparently considerable size shrink almost to nothing when the tissues have recovered from the distention of parturition, as they do in a short time. The extent of rupture may be either seen, or made out by passing a finger into the rectum and thumb into the vagina, so as to hold the remaining recto-vaginal septum between the two. Extensive lacerations often involve the sphincter ani and posterior vaginal wall.

Treatment.—Unless the laceration is quite insignificant, the sum total of treatment consists in bringing the freshly lacerated surfaces together by silver sutures *immediately after labor.* This is to be done, whether the sphincter ani be torn or not. In fact, the more extensive the laceration, the more necessity and greater advisability of stitching up the rent. In slight cases one suture alone may be sufficient. The operation is not very painful immediately after delivery. Anæsthesia is seldom required, unless the rent be very extensive, when ether may be cautiously administered. The sutures should remain *in situ* one week, the patient meanwhile being confined to the recumbent posture, her knees loosely tied together to prevent stretching of the perineum by their separation. Opium may be required to relieve pain; saline laxatives to keep the bowels soluble; and a catheter twice daily to empty bladder. Carbolized vaginal washes twice a day, and extreme cleanliness.

LOOSENING OF THE PELVIC ARTICULATIONS—of the pubic symphysis and sacro-iliac synchondroses—occasionally occurs, either from pathological changes in the joints, or from great violence during forceps and other modes of artificial delivery, or both conditions exist together. The *symptoms are,* at the time, pain and increased mobility of the articulations, demonstrated by grasping the two iliac bones near the anterior extremities of their crests, one in each hand, and moving them slightly to and fro, transversely, in opposite directions. Later symptoms are: pain on locomotion and movement of the lower limbs, relieved by rest and support of the pelvic walls by a wide circular bandage around the pelvis, which constitute the proper treatment, and must be continued until reunion of the parts has taken place. A strong towel or leather belt must be applied so that it embraces the pubic symphysis, without pressing upon the iliac crests. Recovery usually results.

CHAPTER XXVII.

MULTIPLE PREGNANCY—HYDROCEPHALUS AND OTHER ENLARGEMENTS OF THE CHILD.

THE simultaneous existence of two or more fœtuses in the womb is termed "multiple" or "plural" pregnancy. The number of ova may be two, three, four, or five, named, respectively, twins, triplets, quadruplets, and quintuplets. Reported cases of more than five are not well authenticated. Twins occur once in about seventy-five cases; triplets once in about five thousand; quadruplets and quintuplets are extremely rare.

Plural pregnancies are produced by two or more ovules entering the uterus and becoming impregnated about the same time. One ovule may come from each ovary, or two from the same ovary. In the latter case both ovules may come from one Graafian follicle, or each from a separate one. Again, one ovule may contain two germs, like a double-yolked egg from the fowl. These several modes of origin explain the observed variation in the arrangements of the placentæ and fœtal membranes in different cases. Generally each ovum (in twin cases) has its own sac of amnion and chorion, which comes in contact with that of the other as growth advances; but the two sacs do not amalgamate; they remain separate till birth. In these there are two placentæ, usually separate from each other, though they may be near together, or partially united. In other cases each ovum has its own amnion, but both are contained in one chorion. In these the two placentæ are fused together, or the two umbilical cords may be united before reaching the placenta. Rarely both fœtuses are contained in one amnion, as well as in one chorion. Here again the placentæ are united in one mass. Two ova contained in one chorion are of the same sex.

The fact that the vessels of the two placentæ and of the two cords may inosculate with each other (but which cannot be made out before delivery), leads to an important modification of the management of labor in twin cases, to be mentioned presently.

The growth of the embryos in twin cases is seldom exactly equal, and sometimes the difference is very great, one child appearing fully developed, while the other remains very small. One fœtus may die and be thrown off prematurely, while the other remains till full term; or the little dead one may still remain *in utero*, and come away at full term with the live one. These variations are due to conditions favoring the nutrition and circulation of one fœtus at the expense of the other, such as folds or compression of the cord and compression of the placenta. When the two fœtal circulations inosculate in the cord or placenta, one fœtus having a stronger heart than the other would favor its better nutrition and development.

Occasionally one child remains for days or even weeks after the birth of the first one before it is delivered, and thus completes its development. Such cases are best explained by the existence of a double uterus.

Plural births generally occur a little before full term, the degree of prematurity increasing with the number of fœtuses. In twins only a few weeks may be wanting of the usual period; quintuplets are always abortions; the others are intermediate.

Diagnosis.—The certain diagnosis of twins before one child is born is seldom practicable. The following data are, however, sufficient to make a diagnosis probable, and in a few cases, when they are all available, a positive decision may be reached: Large size and irregular shape of the uterus; feeling the numerous parts of the fœtuses, especially two fœtal heads, through the abdominal wall; exaggeration of the signs of pregnancy, especially such as are due to pressure of the gravid uterus; recognition of fœtal motions at different parts of the abdomen; impossibility of *ballottement;* recognition by auscultation of two fœtal heart-sounds, not synchronous with each other, heard loudest at two different points of the abdominal surface, and becoming feeble or inaudible between those points.

After one child is born, the existence of a second is readily made out by the still large size of the womb; by feeling the child through its wall over the abdomen; and, by a vaginal examination, recognizing the bag of waters and presenting part of the second infant.

Women who have borne twins once are likely to do so again. The tendency to plural births is also hereditary in some cases.

Prognosis.—Delivery of the first child usually tedious from inadequate labor pains, due to overdistention of the uterus, and from force of uterine contraction being necessarily diffused through bodies of both children, instead of being concentrated upon the presenting one. Delay is greater when first child presents by the breech, especially so in delivery of the after-coming head. Prolongation of labor, large area of placental surface, and overdistention of womb, predispose to inertia uteri and post-partal hemorrhage. Malpresentations are more frequent than in single births. In about half the cases both children present by the head; in one-third of the cases, one head and one breech; in one-ninth both by the breech; and in one-tenth, either one or (rarely) both children present transversely.

Excluding the complication of malpresentation, the occurrence of twins, with proper management, need not preclude a favorable prognosis in the great majority of cases.

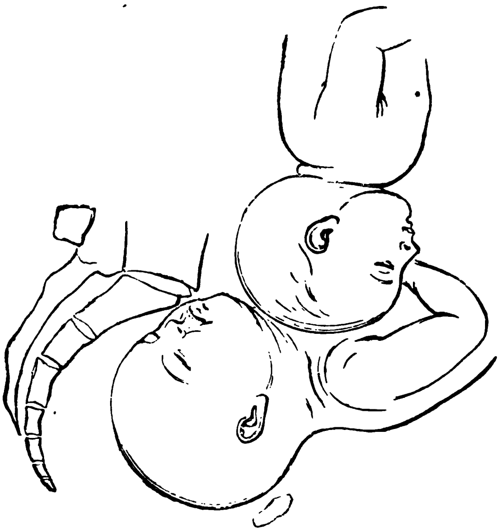
Treatment.—Tie the placental end of the cord when one child is born, to prevent possible hemorrhage from the second child owing to inosculation of vessels between the two cords or placentæ. Let the placenta alone until after delivery of second child, unless it be spontaneously expelled before then, when it may be carefully removed.

The alleged danger of mental shock from telling the female she is to have a second child, is seldom serious, especially when she is told its delivery will be short and easy.

After one child is born, there usually succeeds an interval of rest from labor pains for fifteen minutes, sometimes for half an hour or an hour, when contractions again come on, and the second child is easily expelled, the parts having been thoroughly dilated, and the second child being usually smaller than the first. During the interval, when rest is advisable for recuperation of the (perhaps exhausted) uterus, examination must be made to ascertain the presentation, and correct it if transverse.

After an hour, or before then if the uterus be *not* exhausted by previous prolonged effort, the membranes, if intact, may be ruptured, ergot given, and the womb manipulated through the abdomen, to produce contractions.

FIG. 101.



Locked twins, both heads presenting.

In case of hemorrhage, convulsions, feebleness of the fœtal heart, or any condition rendering immediate delivery necessary, forceps may be applied if the head have descended into the pelvis, and version if it have not. In either case, extract the child slowly, so as not to leave an empty relaxed womb, every means being taken to secure simultaneous uterine contraction.

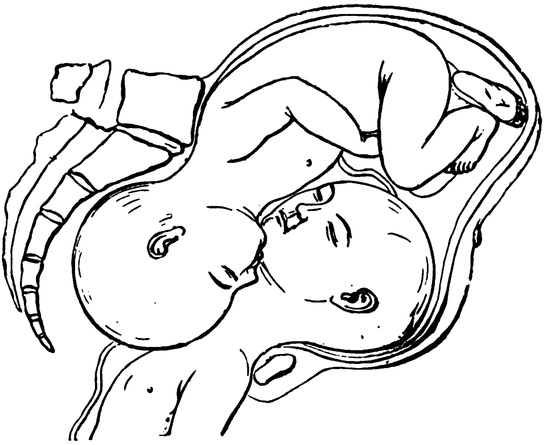
When both children are delivered, extra care is necessary to overcome inertia and prevent post-partal hemorrhage.

Treatment of Locked Twins.—When both children are contained in one amniotic sac, or when, there being two sacs, both have ruptured early in labor, both children may present and enter the pelvis together, and thus getting "locked," prevent delivery.

When both heads present *at the brim*, one may be pushed out of the way by combined internal and external manipulation, and forceps then applied to the other to bring it down into the strait and cavity of the pelvis.

When both heads have *passed the brim*, push back the second one, and apply forceps to the first (the lower) one. Should this be impracticable from the heads having descended too far, the lower head, and then the other, may be successively delivered by forceps. Exceptionally, craniotomy is required. The same mode of treatment may be necessary when one head, having entered the pelvic cavity, is arrested by the jamming of the thorax against the second head, either at or above the pelvic brim. (See Fig. 101, page 288.)

FIG. 102.



Locked twins—one breech, one head.

When the first child presents by the breech and is delivered as far as the head, the latter may remain above the brim, owing to the head of the second child having descended into the pelvic cavity, the head of each child resting against the neck of the other, so as to lock or lap the chins together and prevent further progress. (See Fig. 102, page 289.)

Diagnosis of the exact arrangement of the complication having been made by the hand in the vagina, several different methods of delivery are available, selection of either being a matter of judgment determined by the peculiarities of each case. As a rule, the life of the child whose breech is delivered will be enfeebled or lost by compression of its funis, or it may be already extinct. Hence in selection of operative measures superior value should be allotted the second child. The head of the second child may possibly be pushed up out of the way for the other to pass. The second head *may* (?) be delivered by forceps, while the first remains, but not without difficulty and great danger to both children. The head of the first child may be punctured, or even decapitated, so as to allow extraction by forceps of the second one, the body of the first (when decapitation has been performed) being, of course, previously removed; its head coming after the other child is born. This last method probably affords the best chance for the second child. Most frequently both are lost. When the lives of both are extinct before delivery, there still remains another resort, viz.: that of puncturing the second head and delivering it by forceps or cephalotribe past the body of the lower child.

In cases of *conjoined twins—double monsters*—when the natural powers are insufficient for delivery, version by the feet —and possibly subsequent mutilation—afford the best means of relief. Most such cases are, however, delivered spontaneously.

HYDROCEPHALUS—distention of the skull from accumulation of effused serum—constitutes a dangerous impediment to delivery, leading to rupture of the uterus, or dangerous inflammation and sloughing of the mother's soft parts from their prolonged compression during a tedious labor. When slight in degree, labor may, however, terminate spontaneously without danger. In extreme cases the child's head is as large as that of an adult.

Diagnosis.—Difficult early in labor. Strong pains conjoined with a (known) normal pelvis, but without expected descent of the head, should excite suspicion and induce a careful examination. Owing to unusually large size of fœtal head, the child's body is higher up, hence sounds of fœtal heart heard level with, or even above the umbilicus. When head arrested above superior strait, pass the whole hand into vagina (under ether, if necessary from pain) and feel the head. Its large size, wide, and perhaps fluctuating, fontanelles and sutures are sufficiently characteristic. The head is less convex, and feels more like a flat lid over the pelvic brim, than a globular mass. The sutures and fontanelles become tense during a pain. The cranial bones are less resistant to the finger. An enlarged *posterior* fontanelle is very significant. The prominent forehead and superciliary ridges contrast with the comparatively small face of the child. The previous birth of a hydrocephalic infant, and comparatively feeble fœtal movements, are corroborative circumstances.

In *breech* presentations (they occur one out of five in hydrocephalic cases) the diagnosis is still more doubtful. Nothing wrong is suspected, usually, until the body is born; then there is delay, an unusual resistance—a sort of elastic, resilient resistance—on making traction upon the body. The body *may* be well nourished, but frequently is small and emaciated. The uterine tumor is of larger size than usual above the pubes, owing to its containing the distended cranium.

Prognosis.—The chief dangers to the mother are uterine rupture; exhaustion; laceration, contusion, etc., of soft parts, with subsequent ulcerations and fistulæ;—all preventable, in great measure, by timely assistance of obstetrician. The child generally dies, either before, during, or shortly after delivery. Exceptions possible.

Treatment.—In head presentations, aspirate, or tap skull to lessen its size, when this is absolutely required. Cases of moderate enlargement may be delivered spontaneously, but it is better not to risk mother by delay, for the sake of a child whose survival, at best, is extremely dubious. After puncture, and reduction of size of head, it may be possible to extract by forceps—but they are nearly sure to slip off during traction if the head be very large. Then either the cephalotribe or cranioclast might be used; but the better and more usual plan is to turn and deliver by the feet.

In breech presentations, puncture of the skull may be made behind the ear, or through the occiput, or through the orbit, or roof of the mouth; or the spinal canal may be opened and a wire or metal catheter, etc., passed through it to the brain, and the fluid thus drawn off.

ENCEPHALOCELE.—Associated with, though at other times independent of, congenital hydrocephalus, may be an accumulation of cephalic fluid outside the cranium underneath the scalp, forming a tumor, insignificant in size or as large as a fœtal head, whose cavity may, or may not, communicate with that of the cranium. It is attached to the head by a pedicle and constitutes a so-called encephalocele. Fortunately such tumors are most often attached either to the frontal or occipital pole of the fœtal head, and hence are less liable to interfere mechanically with delivery than when placed elsewhere. The bones of the cranium are also usually softer and more yielding. Puncture of the sac and evacuation of its fluid will remedy any mechanical interference with delivery that may arise.

ASCITES, TYMPANITES, DISTENTION OF THE URINARY BLADDER, HYDROTHORAX, HYDRONEPHROSIS, and various other pathological enlargements on the part of the child, may occasionally lead to difficult labor and require operative interference. They are extremely difficult to diagnosticate before delivery. The diagnosis chiefly rests upon the exclusion of more common causes of mechanical obstruction, and (in the case of gaseous or liquid distention of cavities, etc.) on the *springy, resilient resistance* recognizable when traction is made on the presenting or extruded fœtal parts. Liquid or gaseous accumulations are to be relieved by careful puncture, preferably by aspiration, if the child be living. Forceps, version, and exceptionally embryotomy, may afterward be required.

LARGE SIZE OF THE CHILD. PREMATURE OSSIFICATION OF THE CRANIAL BONES.—In over-long pregnancies (those of 10½, 11, or 12 lunar months) the child is apt to be far above the usual size and weight. Instead of weighing seven or eight pounds (the average), it may reach twelve, fifteen, or even more, and though the increase is distributed over the whole body, the degree of cranial enlargement especially may considerably impede delivery, and a certain amount of difficulty may even attend extraction of the shoulders and body. In carefully measuring the cranium of a child weighing thirteen and a half pounds, immediately after birth, I found all of its diameters nearly an inch above the average length. Such infants are usually males. In well-formed and good-sized pelves, delivery may be accomplished by forceps or version. In very extreme cases craniotomy may become a possible necessity. In delivery of the body, traction and manual aid in furthering the normal mechanism of labor will usually suffice.

PREMATURE OSSIFICATION OF THE CRANIUM sufficient to interfere with moulding of the head, thus producing dystocia (difficult labor), is very rare.

Diagnosis by complete closure of the fontanelles and unyielding resistance of the bones to pressure of examining finger.

Treatment.—Forceps, if required; possibly perforation of the skull.

CHAPTER XXVIII.

TEDIOUS LABOR—POWERLESS LABOR—PRECIPITATE LABOR.

TEDIOUS LABOR (called also "LINGERING," "TARDY," "PROTRACTED," and "PROLONGED").—These terms refer to *time*, but the duration of labor varies so widely within the limits of normality, that it alone is not sufficient to indicate the technical and practical meaning of "tedious" deliveries. Certain other phenomena, mentioned below under the head of "*Symptoms*," are necessary, before any case can be set down in this category.

Causes.—The very numerous conditions liable to produce tedious labor may be broadly comprised in two lists: 1st. Conditions rendering the natural forces of labor deficient; 2d. Mechanical impediments to delivery. Both kinds of conditions may, and necessarily often do, coexist.

The *main* force by which the child is naturally expelled is that of *uterine contraction.* This may be impaired in various degrees by exhaustion of the muscular walls of the uterus from prolonged effort; by over-distention of the womb from hydramnion, plural pregnancy, etc.; by precocious or advanced age at the time of delivery; by violent mental emotion; by distention of the urinary bladder, and of the rectum; by obliquities and displacements of the uterus; by thinning of the uterine walls from frequent and quickly repeated labors, or from fatty or other degeneration of the uterine tissues; by general debility or feebleness on the part of the female,[1] whether resulting from previous disease, enervating habits of life, heat of climate, or exhaustion from hemorrhage, or want of sleep during a prolonged first stage of labor. Loss of power in the uterus also occurs occasionally as the result of uræmia; and morbid adhesion between the decidua and uterine walls is set down as another cause.

The secondary forces of labor, viz., contraction of the abdominal walls and diaphragm, may be impaired by abdominal distention, as from dropsy, ovarian and other tumors, etc.; or by diseases of the respiratory organs (asthma, bronchitis, etc.), which interfere with the woman inspiring and holding in a long breath during the act of bearing down.

The *mechanical impediments* to delivery, from which tedious labor may result, are almost numberless, embracing, of course, every kind and degree of obstruction, such as smallness, deformity, and abnormal growths of the pelvis; resistance, rigidity, deformity, and abnormal growths of the maternal soft parts; and abnormal size, presentation, position, etc., of the child.

Practically the larger number of tedious labor cases are due to partial or complete inertia, or exhaustion of the muscular uterine walls, coming on as the result of prolonged effort, due to coexistence of some mechanical impediment to delivery.

Prognosis and Dangers of Tedious Labor.—The first stage of labor, before rupture of the membranes, may be greatly prolonged, even for several days, without any *necessarily* serious consequences to either mother or child. Exceptions, however, occur. Before rupture the waters act as a cushion between womb and child, thus protecting both from injurious pressure. Pressure upon the funis, and obstruction to the placental circulation, such as may occur when the womb is long contracted round, and in close contact with, the child, are also obviated.

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[1] The womb derives its motor power, in great part, from the (so to speak) electric engine of the spinal cord, but the evolution of nerve-force, when the patient is enfeebled by general debility, loss of blood, etc., is necessarily defective.

During the second stage, when the womb *does* contract powerfully and in close contact with the infant; when the placental circulation, therefore, *is*, or may be, partially interfered with; and when the soft parts of the mother, both the uterus and other parts below, are necessarily subjected to great pressure, the results of prolongation of the labor become far more serious. Swelling, œdema, inflammation, with subsequent sloughing and fistulæ may occur; the child may die from continued compression of its skull, cord, or placenta; and general symptoms of exhaustion and collapse take place, from which the woman, if not promptly delivered, may die on the spot, or succumb afterward from post-partal hemorrhage, puerperal inflammation, septicæmia, etc.

Every case, therefore, of actual or impending tedious labor should excite apprehension for the woman's safety, increasing in degree according to the extent to which the symptoms have progressed, and the estimated difficulty of prompt delivery. With timely assistance safety may often be assured, while delay may render recovery impossible.

Symptoms.—These, be it noted once for all, usually begin moderately, but increase in varying degrees of rapidity with delay. They are: increased *frequency* and *feebleness* of the *pulse; heat and dryness of skin; coated and dry tongue;* persistent nausea and vomiting; in fact, some fever. Increasing *feebleness*, instead of normal increasing strength, of the labor pains, which are also *irregular* in their recurrence, with *shortening* of their *duration* and *lengthening* of the *intervals* between them. The woman is *restless, despondent, irritable*, apparently *wilful.* Moral encouragement no longer serves to revive her hopes and renew her good spirits. The examining finger easily recognizes increased *heat, lack of moisture, swelling*, and perhaps *tenderness* of the vulva or vagina. There is no advance of the presenting part. Things are at a standstill, and soon retrograde from bad to worse if relief be not at hand. The pains stop altogether; pulse very frequent and feeble (110–120, or more); dry, brown tongue; slight incoherence or muttering delirium: husky voice; anxious expression; face dusky, and eyes apparently sunken. Uterus tender on abdominal palpation, and vaginal symptoms just cited are increased. Such symptoms are of extreme gravity.

One other symptom deserves special notice, viz., though the pains are feeble or quite absent, the *womb is spasmodically contracted* round the child, and *remains so continuously*—it is a rigid tonic contraction that has been called, not inaptly, "*uterine tetanus.*"

Diagnosis.—The combination of symptoms just stated, even in their early and slighter manifestations, especially when coupled with prolonged duration and lack of progress in the labor, and evident causes of mechanical hindrance to delivery, can leave no possible room for doubt. Other conditions leading to cessation of labor pains, frequent and feeble pulse, collapse, etc., such as, *e. g.*, rupture of the womb and hemorrhage, have a different history, and the symptoms are sudden instead of gradual in their approach.

Treatment.—The main element of treatment is to treat the case *early*, before the symptoms have progressed beyond recovery. The indications are, in the beginning, to correct or remove existing causes of uterine inertia, and existing mechanical impediments to delivery. When manual or instrumental delivery is required, the operation should be begun, if practicable, before, or at least as soon as, the symptoms of tedious labor *begin.*

In every case ascertain that the bladder and rectum are empty. If they are not, a catheter and purgative enemata must be used.

Excessive distention of the womb from dropsy of the amnion requires evacuation of the fluid by rupture of the membranes. Distention from twins; delivery by forceps or version.

The effect of violent mental emotion can scarcely be ameliorated else than by moral persuasion, quiet rest, and perhaps a composing dose of valerian (elix. valerianat. ammon. gtt. xx), or some other anodyne.

Uterine feebleness from sleeplessness due to a prolonged first stage of labor, requires a full dose of morphia (gr. $\frac{1}{4}$), or of chloral hydrate (gr. xx).

Lateral obliquities of the uterus may be corrected by a finger hooked into the os, while pressure is made in the right direction upon the fundus. The woman should lie on the side opposite that to which the fundus is directed, so that the latter falls straight by its own weight.

Unusual resistance of "tough membranes," or adhesion of the decidua to the uterine wall, must be remedied, respectively, by rupture of the sac, or by breaking up the adhesions with a finger or flexible catheter.

A feeble, debilitated woman must have food (milk is best), and a moderate quantity of wine or alcoholic stimulant, given cautiously in small quantities at short intervals.

Obstructions due to the mother's soft parts are as follows:

SWELLING AND ŒDEMA OF THE ANTERIOR LIP OF THE WOMB, from its getting pinched between the head and pubic symphysis. It must be pushed up with the finger-ends, and held there for several successive pains, until the head slips by it. If *much* swollen and appearing at the vulva, as may occasionally occur, pushing it up is impracticable. Deliver the child by forceps, or by whatever method may be necessary, without delay.

RIGIDITY OF THE OS UTERI is either *spasmodic* or *organic.* The former occurs in highly nervous and emotional primiparæ most frequently; or may be due to premature rupture of the membranes.

Treatment.—When the membranes are intact, time and patience usually remedy the difficulty, but in these cases, as in others where the membranes *have* ruptured, dilatation is greatly expedited by full doses of chloral hydrate, gr. xv, repeated every twenty minutes till two or three doses are taken. An emetic of ipecacuanha (gr. xx) will often relax the os. Warm vaginal douches for half an hour at a time, and stretching the contracted ring by the finger will assist. In *organic* rigidity, due to development of fibrous tissue from previous chronic inflammation, nicking the border of the os, with scissors or a bistoury, to the depth of one-fourth of an inch, at two or three different points, may be necessary when other measures fail. When the constriction is at the *internal* os, use Barnes's dilators.

RIGIDITY OF THE PERINEUM.—*Very rarely* organic, cicatricial hardening of the perineum may require incisions, to be afterward closed by sutures; but in far the larger number of cases, delivery by forceps, and without incision or laceration, is the proper treatment, the rigidity *not* being due to constricting tissue changes.

Other more rare conditions of the soft parts of the mother obstructing labor will be considered in a future chapter.

The mechanical impediments to delivery on the part of the child and pelvis, are, of course, to be treated in accordance with the general principles of operative midwifery.

Thus far we have referred chiefly to removing or obviating the *causes* of tedious labor—in fact, its *prophylactic treatment.*

When tedious labor has actually set in, or has considerably progressed, the main point is *delivery* as soon as possible; the *mode* of delivery being, in the larger number of cases, *forceps.* While true that in a certain number of cases delivery would, in due time, spontaneously occur after some hours' further delay, provided the uterine inertia and general exhaustion were not excessive and there existed no absolute mechanical obstacle to delivery, experience has, nevertheless, amply proved that the required additional delay is *not to be depended on*, while delivery by forceps may be safely and often quite easily performed. The old maxim, "Meddlesome midwifery is bad," has become obsolete. Though delivery *might* in time spontaneously occur, the chances of final and rapid recovery, after labor, are far less than when forceps are applied *without* delay.

Besides forceps, three other remedies are available, viz., manual pressure upon the uterus through the abdominal wall, ergot, and quinia.

Manual pressure is simply a substitute for uterine contraction. It may be used to reinforce feeble pains, or replace absent ones; and must imitate them, especially as regards intermittance, duration, and force, as nearly as possible. Complete expulsion of the child, by pressure properly applied, has even been accomplished when the pains were entirely absent. It is applied thus: the patient lying on the back, spread the palms of the hands out over the sides and fundus of the womb, and when a pain begins, make firm pressure, while it lasts, *downward* and *backward*, in a line with the axis of the plane of the superior strait. Lessen, and then stop pressing, as the pain goes off. If there are *no* pains, imitate them as nearly as possible. If the woman lie upon her side, one hand only can be used (the left, if she lie on the left side; the right, if on the right) to make pressure on the fundus, while the other guards the progress of the presenting part *per vaginam.*

Manual pressure must *not be employed,* of course, when the uterus is very tender on pressure, nor when it is spasmodically contracted round the child, nor when there is any mechanical impediment to delivery.

Ergot, given to expedite labor, is at best a dangerous remedy to both mother and child. Given in the usual dose of 15 or 20 grains of the powder, or as many minims of the fluid extract, it is apt to produce tetanic rigidity, and even rupture of the uterus, besides injuring or killing the child by compression. It certainly must not be given with a view to overcome mechanical obstruction, of whatever degree, and whether in the hard or soft parts. If resorted to at all in tedious labor, a dose of 1 or 2 grains given every twenty minutes, to reinforce feeble pains, is its only safe application; excepting, of course, the conventional full dose, fifteen minutes before delivery (when we are assured the child will be born in that time), to promote contraction during the third stage of labor, and thus prevent post-partal hemorrhage—a precaution doubly necessary after uterine exhaustion from protracted delivery. (See pages 148 and 315.)

Sulphate of quinia, in fifteen grain doses, has of late been used as a substitute for ergot, in stimulating uterine contraction during labor. It is not accompanied or followed by any unpleasant consequences, and is decided in its good effects.

Powerless Labor practically means nothing more or less than the last stage of tedious labor, previously described. The powers of the woman and of her uterus are completely exhausted. Such cases should never be permitted to occur; and scarcely ever would if "tedious" cases were promptly delivered before they become too far advanced, as above recommended. (See "Tedious Labor," pages 296–298.)

Precipitate Labor is one in which the child is delivered with unusual rapidity. It is of comparatively infrequent occurrence. The infant may be expelled unexpectedly, while the woman is standing or walking, and, as sometimes unpleasantly happens, in public places; or while she is at stool. The child may be injured by falling from the mother—such cases sometimes leading to undeserved suspicions of infanticide.

The umbilical cord may be ruptured in its continuity, or torn out at its junction with the navel, but the bloodvessels usually contract and prevent hemorrhage. The child may be born in its unbroken membranes, and drowned in the liquor amnii. Numerous alleged dangers to the mother may result from precipitate labor, but their occurrence is, on the whole, exceptional. These are: inertia and post-partal hemorrhage from sudden emptying of the womb; inversion of the uterus; syncope from abrupt reduction of abdominal distention; rupture of the uterus, laceration of its cervix, and of the perineum, or vagina; procidentia of the womb.

Causes.—Unusually large size of the pelvis (pelvis æquabiliter justo-major). Unusual laxity and diminished resistance of the soft parts. Excessive force and frequency of the pains, and of reflex contraction of the abdominal walls and diaphragm, generally due to peculiar temperament or nervous excitability of the woman.

Symptoms.—The pains come on with little or no warning, and are bearing down in character from the beginning, quickly succeeding each other, and rapidly progressing to very great intensity. In a large pelvis, or when the child is very small, labor may be terminated in a few minutes, without any *necessarily* over-violent pains. Violent pains and a large pelvis may, however, coexist. The child may be born during sleep, the woman dreaming she had colic. Intensity of suffering, on the other hand, may produce transient mania.

Treatment should be preventive in women who have previously had precipitate labor. It is liable to recur—certainly so when the pelvis is over-large. The woman should keep her room during the last week of pregnancy, and go to bed on the first indication of labor pains, a competent nurse having been previously provided.

During labor, anæsthesia constitutes the readiest means of lessening undue violence of the pains. Opium internally; morphia given hypodermically, or by rectal suppositories, when there is time for them to act. Tepid enemata, to wash out the bowel, and an abdominal bandage, have a soothing influence to some extent. The woman must avoid bearing down, as far as possible, by crying out, instead of holding in her breath during a pain; and everything likely to increase uterine contraction must be avoided. Procidentia may require a T bandage over the vulva, an aperture being made in it through which the child may be born.

CHAPTER XXIX.

DIFFICULT LABOR FROM THE MORE RARE FORMS OF OBSTRUCTION IN MATERNAL ORGANS.

IMPERFORATE HYMEN.—An *absolutely* imperforate hymen would prevent impregnation; an *apparently* imperforate one may contain a small, undiscovered opening, large enough to admit entrance of spermatozoids, and may thus afterward constitute an obstruction to delivery. The organ may be perforated with a visible round opening (*hymen annularis*), or with several small apertures (*hymen cribriformis*).

Diagnosis: by impossibility of introducing finger, and by subsequent inspection of parts. Previous history of partial retention of menses.

Treatment.—Incision may rarely be required.

ATRESIA OF THE VULVA may be partial or complete, resulting from inflammatory adhesion; healing of ulcerated surfaces following traumatic injury; or inflammation attending exanthemata; former labors, etc. It may be congenital.

Diagnosis: by inspection.

Treatment.—Obstruction usually overcome by spontaneous dilatation during labor. Artificial dilatation by tents, or Barnes's dilators, or careful incision along median line, while labia are stretched laterally, may be necessary.

ŒDEMA OF VULVA, when excessive, may require numerous small punctures for its relief.

ATRESIA OF VAGINAL CANAL may be *congenital* or *acquired; partial* or *complete.* Non-congenital cases are due to inflammatory adhesions following injury of former deliveries, pessaries, and other traumatic causes; or to inflammation of exanthemata and other constitutional diseases. Considerable surfaces may become adherent, or constricting cicatricial bands only exist.

Diagnosis: by digital examination, or ocular inspection through speculum.

Treatment.—Artificial dilatation by elastic water bags, tents, etc. Dissection through obstructing tissue with finger, or finger-nail, during labor pains, gradually executed, with care not to penetrate vesico- or recto-vaginal walls. Shallow vertical incisions — longitudinal scarifications — for cicatricial bands; and careful vertical incision of central septum of adherence in bilateral union, may be required. Finally, forceps delivery, to prevent prolonged compression of parts by fœtal head.

CYSTOCELE—PROLAPSE OF VESICO-VAGINAL WALL—may be due to, or associated with, retention of urine and vesical distention. The prolapsed wall presents a tense, fluctuating tumor, more or less occluding the vagina; it may be forced down by advancing head, or even ruptured.

Symptoms and Diagnosis.—Known existence of cystocele before or during pregnancy. History of urinary retention. During labor: intense pain; vesical tenesmus and dysuria. May be mistaken for bag of waters; diagnosticate by feeling presenting part above and *behind* cystocelic tumor, and by reduction in size of tumor by catheterism. Diagnosis from hydrocephalic head by same means, and by recognition of enlarged sutures, fontanelles, etc., of cranium.

Treatment.—Catheterism, which is difficult, and *may* be impossible, requiring puncture or aspiration through vesico-vaginal septum. Push back or hold up the prolapsed wall during pains, till the head slips by it. Forceps.

RECTOCELE — PROLAPSE OF RECTO-VAGINAL WALL — is produced, much in the same manner, by distention of rectum by fecal contents, and pushing down of projecting recto-vaginal pouch by advancing fœtus.

Diagnosis: by putty-like consistence of tumor, and indentation of its contents by digital pressure through recto-vaginal wall, or examination *per anum.*

Treatment.—Remove fecal accumulation by emollient enemata, or scoop out hard masses with spoon-handle or finger. Push back prolapsed wall, while head passes by it. Forceps.

IMPACTED FECES, without rectocele, may be sufficient to obstruct delivery.

Treatment same as above described. Prophylaxis by laxatives during pregnancy.

VESICAL CALCULUS—STONE IN THE BLADDER—when of considerable size may, very rarely, obstruct labor, and lead to cystocele, or vesico-vaginal fistula, from compression of vesico-vaginal wall between calculus and fœtal head.

Diagnosis: (from exostosis, etc.) by mobility of calculus, felt *per vaginam*, between the pains, as a hard tumor behind and sometimes above the pubes, and by sounding bladder.

Treatment.—Lift the stone above the pelvic brim by digital palpation *per vaginam.* If this be impracticable, crush it, or extract through rapidly dilated urethra. If these are too tedious, perform vaginal lithotomy through neck of bladder. Vesical calculus recognized during pregnancy should be removed before labor.

VAGINISMUS (spasmodic contraction of the vaginal orifice or canal); CYSTIC, FIBROUS, AND CANCEROUS GROWTHS DEVELOPED IN VAGINAL WALLS; and HERNIAL PROTRUSIONS of large or small intestine and omentum, usually in Douglas' *cul-de-sac*, may, very rarely, lead to sufficient obstruction to require operative assistance before delivery can take place. Intestinal hernia, from liability to strangulation and incarceration, is a serious complication. It should be reduced by manipulation or posture, and delivery must be expedited.

OCCLUSION OF EXTERNAL OS UTERI.—The lips of the os are either completely closed from former adhesive inflammation, or an observed or unobserved opening may exist, of so small a size as to constitute *practical* occlusion so far as delivery is concerned. The adhesions may have followed traumatism of the parts from instruments used in producing abortion, or cauterizations, lacerations, ulcers, etc.

Symptoms and Diagnosis.—Absence of the os on palpation and even on inspection by speculum. A circular dimple may be recognized where the opening ought to be. The cervix and internal os are widely distended, perhaps by the advancing head, their tissues being so thin as to necessitate care not to mistake them for the fœtal membranes; the recognition of their continuity with the vaginal wall would prevent the mistake. In uterine lateral obliquities and exaggerated ante- or retro-version, an existing os uteri may be tilted out of reach of the finger in ordinary vaginal examination, the os only being discovered by passing the whole hand through the vulva, and thoroughly exploring every part of the vaginal roof.

When occlusion really exists, there is danger of rupture of the uterus, as well as of "tedious" labor, if relief be not afforded.

Treatment.—Make an opening where the os ought to be. Having found the circular dimple above stated, it may, if the obstructing septum be thin, be penetrated by pressure of the finger or finger-nail during the pains. Under other circumstances a small crucial incision must be made, preferably with a guarded bistoury, over the same spot, or when no dimple can be discovered, over the most dependent point of the distended cervix. Tents and elastic bags may be necessary to complete dilatation if it fail to take place spontaneously. In a few cases, where no trace of the os could be discovered, Cæsarean section has been successfully performed.

ATRESIA OF UTERINE CERVIX (within the external os) and HYPERTROPHIC ELONGATION of it, the latter generally associated with prolapsus, may require operative interference. Atresia requires either vertical shallow incisions or gradual mechanical dilatation by sponge tents and water-bag dilators. In hypertrophic elongation of neck, dilatation alone is usually sufficient.

CANCER OF THE CERVIX UTERI.—When only involving the lower portion of the cervical canal, the diseased tissues will often yield enough to admit delivery. When extending higher up, the cancerous growth, by its size and want of elasticity, either prevents passage of child, or ruptures with severe hemorrhage.

Prognosis.—Of course, most grave.

Treatment.—Incision of cervix, with application of perchloride of iron to stop bleeding. Perforation may be afterward necessary, if circumstances demand immediate delivery. Another plan, certainly preferable so far as the child is concerned, and, in bad cases, not adverse to the mother's interest, is to perform Cæsarean section as soon as labor begins. Masses of the cancerous growth may sometimes be broken away with the hand, making a sufficient opening to admit version.

CONSTRICTION OF THE UTERINE BODY—ANTE-PARTUM HOUR-GLASS CONTRACTION OF THE UTERUS—is a circular, semicircular, or falciform constriction of the body of the uterus, either at the internal os, or at some point between it and the fundus. It constitutes a most serious obstacle to delivery, but is rare. The constriction is probably due to cicatricial bands, like those observed in vagina and cervix, associated or not with spasms of circular fibres. The child may be held so firmly by the constriction as to resist even violent efforts to deliver by forceps or version.

Diagnosis.—Very difficult. The furrow across the outside of the womb may possibly be felt by abdominal palpation; the inner constriction only by passing the hand into the uterus, when it may be felt to resemble "a sharp metallic ring." It is *not* relaxed by anæsthesia.

Treatment.—Forceps do not succeed; even version may fail, or be attended with rupture, owing to the violence necessary to be used. Version, however, may succeed in some cases. Future experience will probably demonstrate the advisability of early Cæsarean section.

Nauseating emetics; morphia, given to narcotism; and large doses of chloral hydrate, have been suggested to relax the constriction. Success has also been claimed for the nitrite of amyl.

POLYPI OF THE UTERUS—pediculated fibrous tumors—hanging in the parturient canal, may be of sufficient size to obstruct labor.

Diagnosis: by their mobility—if not impacted—insensibility, pediculation, etc. Small ones might, without care, be mistaken for swollen scrotum of breech presentation.

Treatment.—Push the tumor up, out of the way, above superior strait, and retain it there till head takes precedence in descent. When the pedicle is easily reached, remove the growth by *écraseur* or scissors. Some break off during labor, and come away of themselves. Some are sufficiently compressible as not to prevent delivery.

FIBROID TUMORS OF THE UTERUS—not pediculated—whether subserous, submucous, or interstitial, may or may not obstruct delivery, according to their size and position. If high up, above the superior strait, they produce no obstruction, but may render pains inefficient from asymmetrical uterine contraction, and predispose to *ante-* and *post-partal hemorrhage*, as well as to abnormal presentation and position of the child. Situated below the brim, in the lower segment of the womb, they necessarily obstruct labor, and may be large enough nearly to fill the pelvic cavity.

Diagnosis: by history of the tumor, its slow growth and attendant symptoms before pregnancy, and by its firmness, want of fluctuation, etc.

Treatment.—In all cases extra precaution against occurrence of post-partal hemorrhage. Applications of styptic iron solutions generally necessary to arrest it. Tumors *below* the brim, even in apparently very unpromising cases, may be pushed up *above* it by persistent pressure with the hand or closed fist, the patient being anæsthetized. The knee-elbow position may facilitate success. Surgical interference, enucleation of the tumor, or its removal with *écraseur*, when the base is not too large, may be advisable. The only other alternatives in bad cases are Cæsarean section and craniotomy. In less degrees of obstruction forceps may suffice.

OVARIAN TUMORS, whether solid or cystic, occupying the pelvic cavity, usually between vagina and rectum, may obstruct delivery. Even small ones (if cystic) may burst from pressure, which last may also lead to subsequent serious inflammation.

Diagnosis: by rectal and vaginal examination; by fluctuation, and by aspiration and examination of fluid contents.

Treatment.—Push tumor above pelvic brim. This may be impossible, from its adhesions and large size, or incarceration below presenting part. Then puncture cyst, from vaginal wall, during a pain. Should puncture fail to remedy the difficulty, from tumor being solid or multilocular, forceps, version, or craniotomy may be selected, according to degree of existing obstruction. When there is not space enough for *body* of child to pass, deliver by Cæsarean section. Ovariotomy during pregnancy has been suggested.

CHAPTER XXX.

PROLAPSE OF FUNIS—SHORT OR COILED FUNIS.

PROLAPSE OF FUNIS.—A loop of the umbilical cord hangs down alongside of, or below, the presenting part of the child. *Before* rupture of the membranes it is called by some writers "*presentation*" of the funis; *after* rupture, when the loop falls down into the vagina, "*prolapse*"—a distinction of no great value, at least as regards nomenclature.

Causes.—Conditions in which the presenting part of the child does not completely fill, or block up, the ring of the os uteri and pelvic brim, viz., pelvic contraction or deformity; transverse, footling, knee, breech, and face presentations.

It may occur, in ordinary head presentations, as well as under the circumstances just stated, from unusual length of the cord; insertion of placenta near the os uteri; excess of liquor amnii; and gush of amniotic fluid, when membranes rupture at the height of a labor pain, and in multiple pregnancy. Head presentations complicated with that of a hand or foot, or with both, especially favor prolapse of cord. From the far greater *relative* number of head presentations, there are more cases of prolapsed funis associated with *them* than with presentations of other parts. But in a given *equal* number of each presentation, prolapse of the cord will be found least frequently with head cases, as and for the reason before stated. Thus Scanzoni's figures are:

Funis presents once in 304 head cases.
" " " 32 face cases.
" " " 21 pelvic cases.
" " " 12 transverse cases.

Prognosis.—Not unfavorable to the mother, except in so far as may result from emotional disturbance and subsequent breast troubles from child being born dead.

As regards the child, it is a most serious complication. About 50 per cent. die owing to compression of funis during delivery. The dangers are less in proportion to the greater length of time that the membranes are *un*ruptured, and when the presentation and other conditions are favorable to rapid delivery *after* their rupture. Hence breech presentations, which admit of speedy extraction, are comparatively favorable. The breech, moreover, is softer and smaller than the head, hence there is less fear of fatal pressure on funis. Transverse cases do not necessarily involve pressure of cord, and are less dangerous than head presentations *in this respect.* A large pelvis is favorable. *Un*favorable conditions are *primiparity* (owing to length of labor from resistance of soft parts), *contracted pelvis, low placental insertion,* and *early rupture of membranes.*

Diagnosis may be attended with *some* difficulty before membranes rupture, the finger having to feel the cord through them, or through the thinned uterine wall. It feels a soft, compressible, and movable body, in which pulsations, synchronous with the fœtal heart, may be recognized. Pressure of cord during a pain may temporarily interrupt pulsations. Pulsations in vaginal or uterine wall are synchronous with *mother's* pulse. Confounding fingers or toes of child with funis is avoided by remembering their harder consistency, number, and by absence of recognizable pulsations in them. In cases of uterine rupture a prolapsed coil of small intestine has been mistaken for funis. The attached mesentery, and want of pulsation in the intestine, are sufficiently diagnostic with ordinary care. When the membranes have ruptured, or the presenting cord has prolapsed into the vagina, there can scarcely be any mistake. Umbilical pulsation, of course, shows child to be alive, but the pulsation may cease some time before the infant dies, hence auscultate for heart sounds before death is assumed to have occurred.

Treatment.—Preserve the membranes from rupture as long as possible. The cord is safer from pressure, when bag of waters is intact, than it can be made by any operative treatment after membranes rupture. One exception noted below.

Postural Treatment.—Before membranes rupture, place the woman upon her side—upon the side opposite that upon which the cord lies—and elevate the pelvis upon pillows, while the head and chest rest low. The cord may thus gravitate toward fundus uteri during early part of labor. The knee-chest or knee-elbow positions are more effective, but difficult to maintain for any considerable time. They should be resorted to at intervals during early stage, the woman afterward resuming her lateral position as above stated. Later on, when the os is sufficiently dilated for the head to pass, the woman may be placed, temporarily, in a decided knee-elbow posture, when, if the cord slip back, the membranes are to be ruptured, and manual pressure applied externally to produce engagement of the head, which last fills the opening, and prevents reprolapse, the woman subsequently resuming and maintaining her latero-prone position.

Should posture alone not suffice to cause the cord to slip back, let the membranes remain intact.

When, finally, they rupture, artificial *reposition* of the cord must be attempted. There are several methods of operating, all of them being more likely to succeed when the woman is placed in the knee-chest position. The *hand* may be carefully passed into the womb with the loop of cord protected in its palm, until the loop is carried above the equator of the head to the back of the child's neck, the fundus uteri being meanwhile supported with the other hand, and the head gently pushed aside when the inner hand passes alongside of it. When this proceeding is inadvisable, or impossible, from the head having descended too low, two or three fingers may be used to push up the loop, and hold it above the equator of the head until the latter is forced down by a succeeding pain, when the fingers are withdrawn. Repeat during several successive pains, if necessary.

In lieu of the hand or fingers, various *repositors* have been devised. A tape and styletted male elastic catheter answer as well as any of them. A piece of tape three or four feet long is doubled, end to end, and passed into the catheter so that the tape loop can be drawn out an inch or two through the eye of the instrument. The stylet is also passed in, and its extremity made to project from the eye of the catheter. The loop of tape is next passed round the loop of cord, and hooked over the projecting end of the stylet, which last is pushed back into the eye, and shoved up quite to the closed end of the catheter. The two ends of the tape may now be gently drawn upon, until the loop loosely holds the cord in contact with the instrument. The prolapsed funis is then pushed up into the uterus by the catheter until it is quite above the presenting part of the child, when, by withdrawing the stylet, the cord is released. The catheter and tape may be left in till labor is over. A flat piece of whalebone, having an eye near one end, through which a loop of tape may be threaded, has been also employed in a somewhat similar manner, and, after reposition, left in till the completion of labor. Braun's and Robertson's repositors, described in text-books, are modified applications of the same principle. Retention of a replaced funis has been secured by attaching to the cord a collapsed elastic bag or pessary, having a tube by which it may be inflated, after introduction into the uterine cavity.

When reposition fails, as it is often wont to do, the next element of treatment, generally speaking, is *speedy delivery;* or, when circumstances render this impracticable it may be attempted to place the cord where it will receive *a minimum amount of pressure.* Thus when the occiput is placed at one of the acetabula, the loop of cord should be put near the sacro-iliac synchondrosis of the same side. In breech presentations put it near the sacro-iliac synchondrosis which corresponds to the antero-posterior diameter of the breech.

Speedy delivery may be secured by *forceps,* when the os is dilated and the head sufficiently low.

When forceps are not available, the next alternative is *version by the feet,* preferably by external, or by combined external and internal manipulation, and subsequent rapid extraction. The dangers of version, especially when the conditions for its easy and safe performance are not present, should, in the interests of the mother, be earnestly considered before the operation is agreed upon, It should be also ascertained that pressure upon the cord has not already so far injured the child as to render its chances of survival, after version, insufficient to justify any risk to the mother that may be incurred by the operation.

In face presentations, when operative interference is decided upon to save the child's life, an *early* resort to version is the best—that is, when other methods of relieving the cord from pressure have failed.

In breech cases, the extremities should be brought down, and the child rapidly extracted by the methods already stated. (See "Breech Presentations," pages 190–195.) Footlings the same.

In cases of prolapsed funis, associated with contracted pelvis or with transverse presentations, the treatment required for these complications, in the interest of the mother, must take precedence of that solely relating to the interests of the child.

When prolapsed funis is associated, in head presentations, with coincident prolapse of a hand, the prolapsed extremity should be replaced with the funis, and the head made to descend and fill up the space so as to prevent reprolapse. Care must be taken not to displace the head and thus produce transverse presentation: it is best prevented by abdominal pressure during the proceeding.

When a foot presents with the cord and head, or when foot, hand, head, and cord all present at once, it will usually be best to draw down the foot, while the head, cord, etc., are pushed up, thus producing version by the feet. Such presentations are technically known as "*complicated*" or "*complex*" ones; and are also so-called when the cord does *not* prolapse. When the pelvis is large, prolapse of a hand alongside of the head may still admit of spontaneous delivery, or forceps may be applied if the extremity cannot be replaced, and progress is much impeded by the complication.[1] When the child is dead, prolapse of the cord requires no interference. In all cases where hope of life remains, prepare beforehand for resuscitation, by providing hot and cold water, brandy, electricity, etc.

SHORT AND COILED FUNIS.—*Actual* shortness of the cord (cases have been seen as short as two inches), or *artificial* shortening, by its being coiled round the neck, body, or other parts of the child, very rarely offers *considerable* mechanical obstruction to delivery, and more frequently a *slight* prolongation of the second stage of labor results. Very long cords of even six or eight feet in length (such have been observed) may be practically short, from coiling. From stretching of a short or coiled cord during labor there may result, though very rarely, inversion of the uterus; premature separation of the placenta and hemorrhage; rupture of the funis or interference with its circulation, and death of the infant.

Symptoms.—Before extrusion of the child's head, the diagnosis of a shortened funis is not always easy. The following symptoms may be present: a peculiar pain, or soreness, felt during uterine contraction, usually high up at the supposed placental site, which is described by multiparæ as being different from the suffering produced by ordinary labor pains. Later on there is partial arrest of labor pains, especially of bearing-down efforts; and retardation in descent of presenting part, with elastic retraction of it, between the pains, to a greater degree than can be accounted for by resistance of maternal soft parts. Blood may be discharged before birth owing to partial separation of placenta, and when there are no coexisting lacerations of cervix, etc., to explain it. Depression of placental site, during pains, felt through abdominal wall (?). An unusually persistent desire on the part of the woman to sit up, not occasioned by fulness of bladder or rectum. A finger passed high up may touch an existing coil.

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[1] These "complex" presentations will not require further separate consideration in this work.

Treatment.—None is required in the large majority of cases, other than release of a coil round the neck after the head is born. The coil is loosened by drawing it down to form a loop, which is then passed over the occiput. Harmless or at least remediable coils of this sort occur once in about every five labors. When the cord is too short to admit of release in this way, cut it, and deliver at once to prevent the child bleeding and suffocating.

When labor is unduly retarded from a short cord *before* the head is born, let the woman assume a sitting or kneeling posture upon the bed, and lean forward during the pains. The whole womb is thus pushed down and tension of the cord relaxed, while the head, if its rotation have not previously taken place, will rotate and so be prevented from retracting between the pains, thus affording the succeeding uterine contractions a better chance of completing delivery. Should forceps be used in such cases, owing to symptoms of tedious labor, care must be taken not to invert the womb. A cord that is *very* short may require division, *in utero*, before the head can be safely extracted. Such cases are extremely rare. *Knots* in the cord do not impede delivery.

CHAPTER XXXI.

ANÆSTHETICS: CHLOROFORM, ETHER, CHLORAL. ERGOT, QUININE.

ANÆSTHETICS are used in obstretrics to lessen suffering produced by labor pains; to lessen the pain attending certain obstetric operations; to relax the uterus when its rigid contraction interferes with version; to promote dilatation of the os uteri; to reduce excessive nervous excitement which may interfere with progress of early stage of labor; to relieve eclampsic convulsions, and mania.

The practice of giving anæsthetics in *all cases* of labor to lessen pain, has been warmly advocated in certain quarters, but is not, on the whole, advisable.

Complete anæsthesia from chloroform, or ether, undoubtedly *lessens the force of uterine contraction*, and thus retards labor, as well as predisposing to post-partal hemorrhage. Hydrate of chloral, on the contrary, may be given in sufficient quantity to procure relief from suffering without materially interfering with uterine contraction.

CHLOROFORM, when given to lessen the agony of labor pains, as it often is in Europe, though much less frequently in the United States, is usually administered when labor is pretty well advanced—when the os uteri is well dilated, the head descending, and the pains are propulsive. A few drops are placed upon a handkerchief, and held near, not close to, the mouth, at the beginning of a pain, the inhalation being continued till the pain passes its acmé, when it is at once stopped. Pure air should be breathed during the intervals. *Complete* insensibility is not desired; the woman should remain sufficiently conscious to converse. During the *early* stage of labor chloroform should certainly not be given merely to lessen pain. A mixture of one-third absolute alcohol with two-thirds chloroform is less objectionable than chloroform alone. All the uses to which chloroform may be applied in obstetrics may be attained by ether or chloral.[1]

Ether (sulphuric ether) may be safely given during the second stage of ordinary labors at the beginning of each pain, and during its continuance, and *should* be so given, to lessen suffering when the agony is severe and the patient particularly sensitive; but complete anæsthesia and insensibility are not advisable, from fear of post-partal hemorrhage, against the occurrence of which a double vigilance is always necessary when anæsthetics have been used. Ether is not so liable to retard labor from lessening the force of uterine contraction as chloroform, but it is not entirely free from this liability. It is objectionable during the early stage of labor. Ether is inflammable, and hence care is required in using it at night.

During obstetrical operations requiring anæsthetics, anæsthesia should be complete; if it is only partial, the patient is liable to toss about without any control.

In delivering with forceps, under anæsthesia, extra care is necessary to avoid pinching the soft tissues, of uterus and vagina, in the grasp of the blades, since the patient, being insensible, cannot indicate, by her complaints, the occurrence of such a mishap.

Strong contractions of the uterus, rendering *version* extremely difficult and dangerous—or perhaps impossible—are at once relaxed by complete anæsthesia. The child having been turned, it should not be extracted until the womb has, at least in part, resumed its contractile efforts, so as to lessen the danger of hemorrhage.

Anæsthetics are contraindicated, of course, by organic pulmonary and cardiac diseases.

When ether is given for puerperal eclampsia it should be administered just before the beginning of each returning paroxysm in time to prevent the seizure.

Chloral (hydrate of chloral) will probably, in great measure, take the place of chloroform and ether in obstetric practice, except when severe operations are required. Under its influence the woman may sleep during labor without any great suffering, being only awoke by the recurrence of pains, the agony of which is not then acute. It is especially valuable, as already indicated, when the os uteri is thin, rigid, and difficult to dilate, in fact, during the early stage of labor, when ether and chloroform are inadmissible. Chloral does *not* diminish uterine contraction. It, indeed, lessens the *frequency* of the pains, but at the same time renders them *stronger* and *more efficient;* calms nervous excitement, and promotes dilatation of the os. Fifteen grains may be given in a little water or syrup of orange peel, every twenty minutes, until two, three, or (possibly) four doses are taken, according to the degree of somnolence produced. More than a drachm during the whole labor seldom required. Serious and even fatal symptoms have resulted from too large doses.

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[1] The author *never* uses, nor does he, on his own account, advise *chloroform* in obstetric practice. Ether and chloral are safer, and answer every purpose

In puerperal eclampsia chloral is a most valuable remedy, both during and after labor. Large doses of twenty or thirty grains may be taken; or twice this quantity may be given at once, by enema, and repeated in a few hours if the spasms recur.

As a sleep-producer in puerperal mania chloral is better than opium, hyoscyamus, or any other narcotic. It may be combined, to advantage, with bromide of potassium (xv to xxx grains of each).

Bromide of Ethyl has been employed experimentally, of late, as an anæsthetic in midwifery. Its utility has not yet been sufficiently demonstrated to warrant its recommendation. It requires the same precautions as chloroform in its administration, and shares the dangers of this latter drug.

Ergot (Secale Cornutum, Ergot of Rye, Spurred Rye), though by no means allied, in its action, with anæsthetics, may be here considered as one of the obstetrician's special medicaments. Its effect on the uterus is exactly opposite to that of ether and chloroform, with which, indeed, it is sometimes administered as a sort of antidote to their relaxing effect upon the uterine muscles.

When given in ordinary full doses (xx–xxx grains of the powder, or xx–xxx minims of the fluid extract, or ʒj of the tincture, or wine) ergot produces, in the course of ten or fifteen minutes, strong contractions of the uterus, which, when the drug is repeated so as to obtain its full effect, become *persistent* and *continuous* as well as *powerful.* This tonic and unremitting *persistence* of the contractions constitutes one of the chief drawbacks and dangers of ergot. If the child be still unborn, continuous pressure upon the cord, obstruction to the utero-placental circulation, and consequent injury or death of the fœtus may result, unless speedy delivery take place. Injury to the uterine wall from continuous pressure, or actual rupture of it may result, when there exists any mechanical resistance to delivery. Hence the following contraindications to the use of ergot may be positively affirmed: pelvic deformity; malproportion between the size of the child and pelvis; transverse and other malpresentations or positions of the fœtus; undilated os uteri; resisting, rigid perineum. It is not to be used, even in the absence of these conditions, during the *first* stage of labor or when the head is high up near the superior strait. During the *second* stage of labor its use is extremely questionable, unless there be evidence that the child will be born by the time or soon after it begins to act. When powerful contractions are produced by ergot—as may happen from its injudicious administration by nurses and others—and the labor is *not* rapidly completed, forceps should be applied to relieve the child from danger—a proceeding all the more imperatively needed if auscultation reveal irregularity or feebleness of the fœtal heart. On the whole, it is a safe rule to abstain from giving ergot at all before the child is born, except in threatened post-partal inertia of the uterus, when its administration may just precede delivery of the infant: or in retention of the after-coming head in breech presentations as already explained. Its administration in certain cases of placenta prævia is generally recommended, as well as in accidental hemorrhage from separation of a normally placed placenta, but, if the child is to be saved, delivery must be expedited by every possible or practicable means. Ergot was formerly used to induce *premature labor,* but has now been abandoned for better and less dangerous methods.

The chief use of ergot in midwifery is to secure persistent uterine contraction after birth of child. It thus prevents hemorrhage, and lessens tendency to after-pains. The placenta should be removed by "expression" or manual extraction after ergot is given, *in time to prevent its being retained by spasmodic contraction* of the womb—hour-glass contraction—which ergot is liable to produce if the placenta remain undelivered.

QUININE (QUINIA SULPH.), though not yet generally used in labor cases to reinforce feeble uterine contraction, has been proved of sufficient efficacy in this respect to warrant the hope that it may form a safe substitute for ergot during the first and second stages of labor. Dose, x–xv grains every three hours. Its efficacy in relieving after-pains has been previously mentioned.

CHAPTER XXXII.

PUERPERAL ECLAMPSIA DURING LABOR.

PUERPERAL ECLAMPSIA, associated with *premature* delivery, due to uræmia, from albuminuria and renal congestion or inflammation during pregnancy, have been already discussed in so far as their etiology, symptoms, and *prophylactic* treatment are concerned.[1] Their *obstetric* treatment does not differ materially from that of eclampsia occurring during labor at term, here to be considered.

Puerperal convulsions during labor, besides arising from uræmia, may be due to other forms of blood-poisoning, viz., cholæmia (retention of bile); imperfect elimination of carbonic acid by the lungs; medicinal poisons, as lead, narcotics, etc.; septic poisons, as those of typhus and other fevers. The opposite conditions of congestion and anemia of the brain may produce eclampsia; as may also general anemia, plethora, hydræmia, and leukæmia. Convulsions often precede death from hemorrhage during labor. They may arise from violent emotional disturbance, or from reflex irritation due to indigestible food, fecal accumulations, etc. The well-known increased excitability (so-called "convulsibility") of the nervous system in pregnant and parturient women predisposes to eclampsia from slight causes.

Symptoms and Clinical History.—Previous occurrence of decided renal symptoms, general dropsy, etc., during pregnancy, especially signs of impending uræmia.

Preceding the actual occurrence of a spasm, there are irritability of temper, slight or severe headache, dizziness, spots before the eyes, impairment or loss of sight, *tinnitus aurium*, hallucinations, deafness, intellectual disturbance, unusual desire to sleep, with perhaps stertorous breathing, vomiting, etc. Some or all of these may be present.

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[1] See Chapter VIII., p. 109.

The actual convulsion may resemble *epilepsy* or *hysteria*. Text-books give *three* varieties: epileptic, hysterical, and apoplectic. Hysterical attacks are slighter in degree, and consciousness is *not entirely* lost. *Apoplectic* ones are rare, and are followed by complete coma and paralysis, due to effusion, or a clot of blood within the cranium. The *typical* puerperal convulsion is *epileptic* in character. It begins with rolling of the eyeball, puckering of the lips, drawing of the lower jaw on one side, bending the head back, or toward one shoulder. Then follow twitching of the facial muscles and of those of the extremities; protrusion of the tongue; grinding of the teeth; violent jerking of the arms: in fact, clonic spasm of the *voluntary* muscles, and of some of the *in*voluntary ones, notably those of respiration: hence lividity of the lips and face, distended veins in the neck, and apparent impending cyanosis. At first, however, the respiration is hurried and irregular, hissing, through bloody froth, between the teeth. Urine and feces sometimes involuntarily discharged. Duration of the convulsion from one to four minutes. Complete unconsciousness during paroxysm, the patient having afterward no recollection of it. The fits may recur at varying intervals, of minutes or hours, and in varying number, from two or three to twenty, thirty, or more. They are apt to recur with the recurrence of a labor pain. The uterus may participate in the spasm, and expel the child rapidly.

Prognosis.—Always serious both to mother and child, increasing in gravity with the severity of the symptoms and existing impediments to speedy delivery. The convulsions may persist even after labor. Fortunately they do not occur more than once in four or five hundred labors.

Treatment of Convulsions during Labor.—If possible ascertain the cause. A history of uremia attends most cases, the treatment for which (purgatives, diaphoretics, certain diuretics, and methods of reducing renal congestion) has been already considered (Chapter VIII.). Should this treatment *not* have been previously employed, purgation may still be of benefit. A drop of croton oil, or a fourth of a grain of elaterin, may be placed on the back of the tongue if the woman be comatose; or, if she can swallow, calomel and jalap may be given by the mouth.

The relief of convulsions, meanwhile, chiefly claims our attention. During the paroxysm, prevent the patient from self-injury, and place a piece of wood, or a spoon-handle wrapped in flannel, between the teeth, to protect the tongue from being bitten.

When the fit is over, the remedies are: in *decidedly plethoric* women, bleeding from the arm. It reduces cerebral congestion and vascular fulness—conditions indicated by a strong, full, bounding pulse and lividity of the face—and may prevent a fatal apoplexy. After bleeding, or when it is not deemed advisable, inject ¼ grain of morphia hypodermically, and give full doses of chloral hydrate (gr. xv–xx) with bromide of potassium (gr. xxx) every three or four hours. If the patient cannot swallow, inject the chloral and bromide into the rectum in doses of xxx grains each. Anæsthesia with ether (some prefer chloroform) may be resorted to, on the approach of returning paroxysms.

As a general rule, it is advisable to deliver by forceps as soon as dilatation of the os uteri will permit; but this is not by any means always required. Should the convulsions have been sufficiently controlled by other remedies, labor may go on and be left to complete itself, any violent efforts with forceps being liable to provoke a repetition of the eclampsic paroxysm. If the convulsions continue in spite of treatment, delivery offers the only port of safety. Then, if the os is *not* sufficiently dilated for forceps to be applied, it may be either incised or dilated with Barnes's bags—the former perhaps being, on the whole, preferable—though neither proceeding is universally commended, the other alternative, of version by the feet, being sometimes selected instead. Version, however, ought not to be attempted unless the conditions favorable for its easy performance are present. Anything like violent or prolonged manipulation during its performance would be almost sure to increase the convulsions. Much will depend upon the particular circumstances of each case and the judgment and skill of the operator. When circumstances render both forceps and version difficult and inadvisable, and the symptoms increase in severity in such a degree as to threaten the woman's life unless delivery soon take place, craniotomy may be required, even though the child still live. Such cases are very exceptional.

It is sometimes advantageous to rupture the membranes early, even before dilatation of the os, the pains afterward becoming more efficient, and the tendency to convulsions diminished, owing perhaps to consequent reduction in the size and weight of the uterus and in its pressure upon renal veins.

The hot, wet pack, and vapor bath can be used to advantage, even during labor, and without interfering with its progress, retained urinary excreta being thus eliminated with the profuse perspiration that ensues.

In puerperal convulsions *not* of uremic origin, diligent inquiry must be made for other causes, and their removal attempted. Distention of the bladder and rectum, or a stomach overloaded with indigestible food, may lie at the root of the disorder. Treatment accordingly.

Hysterical convulsions require valerian and other antispasmodics. Anemic patients may need alcoholic stimulants, and afterward iron, food, and bitter tonics.

During third stage of labor the placenta must be delivered without delay; clots removed, and firm uterine contraction secured. Then, perfect rest in a dark room, cold to the head, laxative enemata, attention to the bladder, milk diet, and, if convulsions still continue, morphia or chloral and bromide of potassium as before. Subsequent renal disease may, exceptionally, require treatment.

CHAPTER XXXIII.

PUERPERAL SEPTICÆMIA. SEPTIC AND NON-SEPTIC PUERPERAL INFLAMMATION.

PUERPERAL SEPTICÆMIA (CHILDBED FEVER, PUERPERAL FEVER) is a fever beginning within a week after labor—usually from the third to the fifth day inclusive—attended with *septic infection* of the woman's blood, and with *acute inflammation* of one or more of the *reproductive organs*, or of their *annexæ*, or of both. Other organs *not* belonging to the reproductive system—notably the serous membranes—may be *secondarily* inflamed also.

Hence may arise in respect to the reproductive organs:

Puerperal metritis (inflammation of the uterus).

Puerperal vaginitis (inflammation of the vagina).

Puerperal peritonitis (inflammation of the peritoneum).

Puerperal cellulitis (inflammation of pelvic cellular tissue).

Puerperal phlebitis (inflammation of uterine and pelvic veins).

Inflammation of the *uterus* may involve one or more or all of the tissues of the organ—mucous membrane, parenchymatous and muscular wall, serous covering, subserous cellular tissue, veins, lymphatics.

Inflammation of *vagina* may be *superficial* (catarrh of the mucous membrane), or *deep* (attended with ulceration). The ulcers may become *diphtheritic* in character.

Inflammation of peritoneum may be limited to the folds of peritoneum within the pelvis (*pelvic peritonitis*), or extend to those higher up in the abdominal cavity (*diffuse* or *general peritonitis*).

Inflammation of the cellular tissue may affect chiefly the cellular layer connecting the uterus with its peritoneal covering (parametritis), or extend to other layers within the pelvic cavity (pelvic cellulitis).

Inflammation of the veins and lymphatics may be confined to limited areas or special branches of those vessels, or involve many of them.

Since the separate diagnosis and clinical isolation of these numerous inflammations are often extremely difficult, it is fortunate they do not each require a decidedly different treatment.

Puerperal Inflammation without Septicæmia.—The several inflammations, just mentioned, *may* occur after labor *without* septicæmia, or clinical evidence of septic infection. Such cases are accompanied with fever *resulting from the acute inflammation* going on; they are likely to follow bruising or other tranmatic injury of the parts during labor. The great danger is, that they are liable to be attended with septicæmia later during their course; hence, as we shall see, their treatment, in so far as relates to antiseptic precautions, ought to be nearly the same as when septicæmia actually exists. The septic element is not, however, a *necessary* ingredient in these cases.

CAUSES OF PUERPERAL SEPTICÆMIA.—The *physiological* condition of women soon after labor, itself predisposes them to septic poisoning, from absorption into the blood of effete matters produced by involution of the uterus and other organs. Failure to reassimilate, or to excrete, such products of tissue-degeneration, leads to their accumulation in the blood and consequent septic poisoning, or, at any rate, consequent increased susceptibility to other sources of septic infection.

These additional sources of septic contamination may originate in the woman herself (*autogenetic infection*), or be introduced from without (*heterogenetic infection*).

Sources of Self-infection.—Decomposing retained coagula of blood, fragments of membranes, ovum, or placenta; putrid lochia, a dead fœtus, decomposing sloughs following pressure and inflammation of soft parts; tissue decomposition, as in carcinoma, or pus accumulations. Previous bad health, and the debility and blood changes following profuse hemorrhage, increase the susceptibility to septic infection from these and other sources.

Sources of External Infection.—Septic poison conveyed from other women already affected with puerperal septicæmia on sponges, clothes, sheets, bed-pans, instruments, or the hands of physicians, nurses, and attendants, or by a tainted atmosphere. Hence endemics of the disease in hospitals and special localities.

Infection by cadaveric poison from the hands of persons previously engaged in dissection or post-mortem examination of bodies, especially of bodies dead from septicæmia, or other decidedly infectious or contagious complaints.

Infection from persons suffering from typhus fever, scarlet fever, erysipelas, diphtheria, and other zymotic diseases.

The influence of cadaveric poison from bodies *not* previously affected with septicæmia, and of poison from other zymotic diseases, has been questioned, but it is better to admit it, and err, if at all, on the side of safety.

Mode of Entrance of Septic Poison.—The septic matter is absorbed into the blood, chiefly through *freshly wounded surfaces* made by slight lacerations or fissures about the os and cervix uteri, vagina, fourchette, perineum, etc., which nearly always occur during labor; or through the surface from which the placenta has been separated. More extensive ruptures of perineum, vagina, or uterus, of course increase the danger. It is also possible that the unbroken mucous membrane may absorb the poison, especially when exfoliation of its epithelium, after labor, has taken place. But this last is an unsettled point as yet.

When the wounded surfaces begin to heal—to granulate—the danger of septic absorption is generally over. Granulating surfaces do *not* absorb the poison. Hence the woman is comparatively safe, as we have seen, after five or six days following delivery.

PROGNOSIS.—Puerperal inflammation *with* septic infection is always serious, though much can be done, with proper treatment, to save life. Danger increases with degree of septic infection. When the poison is extremely virulent—as in epidemics and endemics of the disease—death may occur within twenty-four or forty-eight hours, even without recognizable post-mortem evidences of inflammatory lesions. Cases of less severity may continue five or six days, when, if death do not take place, convalescence usually begins. Much will depend upon the extent and severity of coexisting inflammations, and the organs or tissues involved. Among the worst cases are those involving the veins, lymphatics, and peritoneum. Inflammations of the uterus, vagina, and cellular tissue are somewhat less fatal.

Puerperal inflammations with fever, but *without* septic infection, are far more likely to recover than septicæmic cases.

POST-MORTEM APPEARANCES.—In *profound septicæmia*, when the septic infection is rapidly fatal, there may be no appreciable lesions, other than significant blood changes, such as occur in many malignant endemic and epidemic diseases. The blood is darker and more watery, with an offensive odor; its red corpuscles are diminished, and white ones increased. Ecchymoses may, however, be found in various organs, and the microscope reveals histological evidences of commencing, but undeveloped, inflammation.

In *puerperal peritonitis* with *septicæmia*, the peritoneum contains a brownish, dirty-looking fluid, with floating flakes of lymph. Patches of fibrinous exudation exist on many of the viscera, but there are no recent adhesions. Other serous membranes may present the same appearances. Intestines congested and distended with flatus.

In puerperal peritonitis *without* septicæmia, the inflammatory exudation *does* become organized, forming adhesions by which the adjacent layers of the peritoneum become matted together.

In *puerperal metritis* the womb is found enlarged; its tissues infiltrated with pus, perhaps in a semi-sloughing, or even gangrenous, state. The mucous membrane is softened and thick, or ulcerated and gangrenous, especially along the margins of existing fissures upon the cervix, or of the placental site. The uterine cavity contains tenacious mucus, blood, and epithelial *débris*.

In *puerperal phlebitis* the inflamed veins are thickened and enlarged, and contain effused lymph, fluid pus, and blood-clots in various stages of disintegration. In many cases pyæmic abscesses are found in the joints, lungs, liver, kidneys, spleen, eye, and other organs, with evidence of numerous intercurrent inflammations.

In *puerperal vaginitis* the vaginal walls and vulvar mucous membrane are swollen, congested, œdematous, or ulcerated, sloughing, and gangrenous. Sometimes ulcers are covered with diphtheritic deposit. Vesico-vaginal and recto-vaginal fistulæ may exist.

In *puerperal cellulitis* and *pelvic peritonitis* there are masses of effused lymph exuded between the folds of pelvic peritoneum, or in the subserous cellular tissue, forming thick, diffuse adhesions. The inflammatory exudation may degenerate into pus; hence purulent collections and fistulæ, from burrowing and opening of resulting abscesses.

Post-mortem appearances usually present a combination of pathological lesions due to coexistence of two or more of the above-named inflammations.

SYMPTOMS, ETC.—These vary with the degree of septic infection and local inflammation, and the particular organs inflamed.

Septicæmia, without clinical evidence of local inflammation, begins with shivering, or a distinct chill, followed by fever. Temperature 103°, 105°, or more. Pulse *small, feeble,* and rapid, *from the first,* varying from 120 to 140 or 150 per minute. Little or no pain and tenderness over uterus and abdomen. Decided tympanites. Tongue coated; first moist, then dry, and later brownish, or even black. Lochia arrested; or, if present, very offensive. Diarrhœa, which may be difficult to control. Clammy sweats; anxious countenance; breathing shallow and panting; breath of heavy, sweetish odor; muttering delirium; stupor; coma. Usually ends fatally, and in a few days. Thus the characteristic features of septicæmia are *from the first* asthenic or adynamic. Prostration of vital powers, tending to the so-called "typhoid" condition.

SYMPTOMS OF LOCAL INFLAMMATION. METRITIS (INFLAMMATION OF WOMB) is one of the milder forms of puerperal inflammation. Begins with chilliness, which *may* be absent or overlooked. Then come fever; rise of temperature rarely over 102° or 103°; pulse 100, or 110; fever may be remittent or intermittent. Uterus is enlarged, flabby, and tender on pressure; its involution is retarded; after-pains severe; lochia fetid, and retain bloody character longer than usual; os uteri hot, swollen, and tender to touch, and higher up than usual. Moderate tympanites, or perhaps none.

Respiration not much accelerated.

To these symptoms *may be added* those of septicæmia, just previously described, which, of course, altogether change the general aspect of the case; or the metritis and septicæmia may begin together.

VAGINITIS (COLPITIS, INFLAMMATION OF VAGINA) begins with chilliness and mild fever, as in metritis. *Local* symptoms are: Swelling, redness, œdema, and tenderness of vagina and vulva. Discharge thin, fetid, and purulent. Painful defecation and urination. Mucous membrane may proceed to ulceration and sloughing, or even gangrene. Ulcers may become diphtheritic and spread to neighboring parts.

To these symptoms *may be added* those of septicæmia, or vaginitis and septicæmia may begin together.

PUERPERAL PERITONITIS is one of the most common, most severe, and most fatal forms of puerperal inflammation. Usually associated with septicæmia from the first. Symptoms *then* are: Severe chill; high fever; temperature 104°, 105°, or

106°; pulse rapid, 120 to 160 per minute; small, thready, and feeble, with possibly some tension at first. Thirst. Tongue successively furred, red, dry, brown, or black. Expression anxious; sense of impending danger. *Great pain and extreme tenderness* over the whole, or a large part, of the abdomen. Great *tympanites Diarrhœa*, probably preceded by constipation in the beginning. *Vomiting*—ejecta being greenish, or even feculant. *Decubitus* on the back, with knees drawn up. *Respiration* altogether *thoracic, short*, jerky, and accelerated to 30, 40, or 50 in a minute. *Lochia* arrested or fetid. *Breasts* flabby; milk suppressed. Later: diarrhœa profuse, offensive, and uncontrollable; delirium; clammy sweat; hiccough; cold extremities; picking at the bedclothes; and, not unfrequently, death.

Intercurrent attacks of inflammation in other serous membranes—pleura and pericardium—liable to occur.

In puerperal peritonitis *without* septicæmia, the pain and tenderness of the abdomen extend *over a smaller surface* in the neighborhood of the uterus, and *not* higher up. The bowels are *constipated*. Tongue *not much altered*. The fever is *sthenic*, instead of asthenic; pulse wiry and *hard*, instead of feeble, though still frequent. The symptoms of profound involvement of the nerve-centres, delirium, etc., are absent, or mild in degree. To these symptoms there is constant danger that those of septicæmia *may be added*, when the case would, of course, present the characters just previously described.

Puerperal Phlebitis (*Inflammation of uterine or other veins*) begins with a *chill*, or slight shivers, followed by fever and rise of temperature—102°–103°—ending in *profuse perspiration*. Fever *remits*. Pain in uterus, but *not* severe; a tender, cord-like induration may sometimes be made out on one side of the womb, by grasping it through the abdomen. *Slight* tympanites. Tongue coated. Bowels loose. Lochia generally plentiful, but offensive. Symptoms of peritonitis absent. The disease is difficult to isolate clinically, from metritis, *until lodgement of thrombi or emboli in distant parts* develops secondary abscesses and *pyæmia*, which is the great danger. Then occur: successive chills at irregular intervals; continuous fever; higher temperature; small and rapid pulse; with delirium or stupor; dry, brown, cracked tongue; tympanites and typhoid symptoms.

Pains in various parts, notably in the joints, which are (some of them) flushed with erysipelatous redness, and tender to touch and motion, followed by swelling and fluctuation from formation of abscesses. Pus formations also occur in liver, lungs, spleen, kidney, muscles, and sometimes in the eye.

Symptoms of septicæmia nearly always superadded. Inflammation often extends to peritoneum and uterus.

Puerperal Cellulitis and *Puerperal Pelvic Peritonitis* are, clinically, almost inseparable, and may here be considered together. (By *pelvic* peritonitis is understood inflammation of those folds or layers of peritoneum covering or immediately attached to the uterus and pelvic cavity; in fact, inflammation of the *pelvic* folds of peritoneum, and *not* of the *abdominal* folds.)

Symptoms.—Premonitory sleeplessness; excessively painful after-pains, and slightly frequent pulse. Then, in a few days, chill and fever more or less marked. Temperature 103°–105°. Pulse seldom over 115 or 120. Pain in pelvis, extending to lower part of hypogastric region, with tenderness on pressure along sides of uterus. Pain may be slight or overlooked, or increased by extending lower limbs. Bowels constipated; defecation painful; headache; tongue coated, but moist. Fever and other acute symptoms subside in about a week; but relapses are common. If inflammation continue, exudation takes place in the inflamed tissues, leading to swelling and induration alongside of and around the uterus, on one or both sides, forming diffuse tumors which can be felt both by vaginal and abdominal or rectal examination. Such cases become chronic, and may end in suppuration and abscess, which last may burst externally, or into some adjacent viscus.

To these symptoms those of septicæmia may at any time be superadded.

The several inflammations whose symptoms have now been enumerated, seldom occur separately in puerperal women. It is more usual to find several of them coexisting, or running into each other; hence the clinical features of any single case may be thus modified.

Treatment.—While, as we have seen, local puerperal inflammations *may* occur from traumatism, etc., during labor, *without* any necessary septic infection, such cases are exceptional, and during their course are liable to become septicæmic, hence it is safest to adopt *antiseptic treatment* in all cases.

Antiseptic Treatment.—Ascertain whether there exist, and if so remove, either with the fingers (first thoroughly cleansed and disinfected), or by antiseptic injections, any retained fragments of placenta, ovum, membranes, blood clots, or lochia, in the vagina or uterus. The injecting fluid to consist of carbolic acid ʒij to a pint of *tepid* water; or of the corrosive sublimate solution, its strength being 1 : 3000—*i. e.*, grs. iiss, to one pint of *tepid* water. Two or three pints (of either solution) will be required for each injection, the real object being *irrigation*, or washing out, of the vagina or uterus. It may need to be repeated twice, or even thrice, daily. Of these two solutions, carbolic acid is the safer, though the corrosive sublimate one is the best germicide. The latter, however, must be *positively excluded* in cases where there is *kidney disease.* It is also objectionable in anemic women; in women who have been previously subjected to mercurial treatment; and in cases of atony of the uterus, when the uterine cavity may retain some of the fluid. In some women the sublimate solution produces burning pain and irritation of the genitals. In these it should be used in weaker strength,[1] or exchanged for carbolic acid. No part of either solution should be permitted to remain in the uterus or vagina.

Whichever fluid is used, may be injected into the vagina only, or into the uterus also, according as one or the other is assumed or known to contain septic matter. Since vaginal injections are quite harmless, and since the uterus may *not* contain septic matter, the vagina should be *first* washed out; when, if symptoms be relieved, and no offensive discharge subsequently flow from the uterus, the latter may not require to be injected. But in bad cases it is generally otherwise: the womb must then be washed out also. The injecting-tube (for the uterus) must either consist of a double canula, or it must be ascertained that there is ample room for the injection to escape through the os, alongside of the tube, as fast as it is thrown in, which must be done slowly, and continued until the returning fluid is free of all offensive odor, and as clean almost as when introduced. In cases of septic uteri, the os is usually open enough to admit a tube as large as the little finger—⅜ths of an inch in diameter. It should be of glass or vulcanite, and have a slight curve, four inches from the end, corresponding with the axis of the uterine cavity. The injec-

[1] A solution so weak as 1 : 10,000 has been used, with (alleged) efficacy.

tion solution should be passed in, in a continuous stream, from an elevated vessel, or fountain syringe; not in jerks, as by a Higginson or Davidson syringe. In the absence of a better apparatus, a large-sized (No. 12) gum elastic male catheter, attached to a piece of rubber tubing (which, however, shall admit no bubble of air) connected with an elevated vessel containing the solution, will answer every purpose. The injection into the *womb* must be given by the physician, and not entrusted to the nurse. Its immediate effect is a sense of comfort announced by the patient (who often asks for its repetition), and within an hour or two, decided reduction of fever and lower temperature. It may require to be continued several days or a week.

After each irrigation a suppository containing 15 or 20 grains of iodoform (see formula, p. 152) may be introduced into the uterus (or vagina p. r. n.), and iodoform gauze, or a pad of corrosive sublimated absorbent cotton, applied to vulva.

Solution of iodine (tinct. iodin. ʒj to water Oj) and of biniodide of mercury (hydrarg. biniod. gr. 1¾ to boiling water Oj,) with a little alcohol to assist in dissolving the drug, have been lately employed for injections in these cases; but thus far, there is no good reason to select them in preference to the two others already mentioned, and whose utility has been amply demonstrated.

Next in importance to antiseptic injections is *support of the patient by food*, and, if necessary, alcoholic stimulants. Give milk, or strong beef essence, or beeftea, in small quantities frequently repeated. A single tablespoonful every hour may be all the stomach will retain. When the pulse is feeble and frequent, with other signs of great debility, give good brandy, rum, or whiskey in half-ounce doses every three or four hours; or more frequently still if exhaustion be very profound. As much as half a pint, or even more, may be required each day.

To *reduce temperature*, give quinine in doses of 15 or 20 grains twice daily, or oftener if required. Its unpleasant effect upon the ears and head may be diminished by giving with each dose 10 or 15 minims of hydrobromic acid; or, it may be given in water, or a mucilaginous mixture, with 15 grains of subnitrate of bismuth and 5 grains of bicarbonate of soda. As a substitute for quinine, salicylic acid, or salicylate of soda, in doses of 15 or 20 grains, may be given; but it is contraindicated when the pulse is very feeble. Another substitute—highly recommended by Playfair—is "Warburg's tincture," which, however, contains quinine. Dose, ℥ss. It produces profuse sweating, but is often rejected by the stomach. Antipyrine, in 15 or 20 grain doses, every hour, until temperature is reduced (one or two doses may suffice), has also been used; but as yet there is no proof of its superiority over quinia.

Cold.—Various methods of applying cold for the relief of *high fever* have been devised. Sponging with cold water and vinegar, or water with alcohol and bay rum, and the wet sheet—"wet pack"—are the most available. Ice caps to the head, ice bags over the abdomen, cold affusion, continued irrigation of the uterus or rectum with cold water, and cold baths, have also been resorted to, and with benefit, but are not in general use.

To relieve pain—especially in extensive peritoneal inflammation—inject morphia hypodermically in large doses, gr. ¼, ⅓, or even ½. There is a special tolerance of it in *peritonitis*. The specific "*opium treatment*" of general peritonitis consists of giving one or two *hundred* grains of opium daily—or an equivalent of morphia—for several successive days. Recoveries are reported, even of the, apparently, most unfavorable cases, but the method is not generally admitted or practised. In addition to morphia, *warm stupes, with turpentine,* applied over abdomen, lessen pain and tympanites, and are salutary in producing some counter-irritation.

Arterial Sedatives.—Tinctures of aconite, of digitalis, and of veratrum viride have been employed in small doses, frequently repeated, to reduce the frequency of the pulse. They are, however, unsafe, and not to be trusted to unskilful hands.

Bloodletting.—Venesection is not advisable. Leeches to the abdomen, *at the very beginning of peritonitis,* relieve pain and sometimes appear to cut short the inflammation.

Purgatives, if given at all, must be administered at the onset of the attack, and always with caution against subsequent diarrhœa. Should there have been previous constipation, castor oil, or calomel, gr. v–x, with double that quantity of soda bicarb., may be given *once,* as recommended by Prof. Barker; but in *general peritonitis* enemata are preferable. Turpentine, with the latter, is of value when there is tympanites. Constipation having been relieved, no repetition of purgatives is admissible.

In the *pyæmic* phase of the disease accompanying phlebitis, opium is not well borne. Tincture of chloride of iron (10–20 minims every three or four hours) is given, as in surgical pyæmia, but is of dubious utility in very bad cases. Antiseptic treatment, food, stimulants, and surgical management of complicating pus-formations, form our chief reliance.

In pelvic *cellulitis*—or *pelvic* peritonitis—apply warm stupes or poultices over lower part of abdomen, and use prolonged hot douches in the vagina. Collections of pus in the pelvic cavity to be relieved by aspiration or incision. In the latter event antiseptic washes and drainage may be afterward employed. Prolonged rest after convalescence.

Sloughing ulcers and diphtheritic patches, in addition to antiseptic washing, may, when within reach, be touched with hydrochloric acid, or with a ten per cent. solution of carbolic acid, or with a mixture (in equal parts) of tinct. iodin. comp. and liq. ferri presulph., and afterward dusted with iodoform. Diphtheria of puerperal wounds is nearly always associated with septicæmia; hence food, stimulants, quinine, iron, etc., will be required as in other cases of septic poisoning.

Prophylactic Treatment of Puerperal Septicæmia.—Protection from the sources of septic infection (autogenetic and heterogenetic) already stated. Pure air and perfect ventilation of hospitals and lying-in rooms, the latter especially by means of some *opening level with or higher than* the ceiling (where foul air always collects) and admission of pure air from below. Destruction of all sponges, clothes, etc., used by a puerperal septicæmic patient. Absolute antiseptic cleanliness with regard to instruments, hands, and appliances used in the lying-in room. Carbolized *vaginal* injections, twice daily, after all *prolonged* labors, especially when attended with *laceration*. Physicians and nurses who have attended puerperal septicæmic cases must not go to other lying-in women, without complete change of clothing, a carbolized bath, and use of nail-brush. Infected clothing to be burned, boiled, or subjected to prolonged antiseptic fumigation with sulphurous acid.

CHAPTER XXXIV.

CENTRAL VENOUS THROMBOSIS—PERIPHERAL VENOUS THROMBOSIS—ARTERIAL THROMBOSIS.

CENTRAL VENOUS THROMBOSIS (HEART-CLOT).—Blood in the right ventricle of the heart coagulates, forming clot, which plugs, and perhaps extends into, the pulmonary artery, thus usually producing sudden death by asphyxia, in consequence of obstruction to entrance of blood-current into lungs.

Causes.—Conditions by which tendency to blood coagulation is increased, viz.: 1. *Hemorrhage,* either before, during, or after labor. Blood-loss is always followed by increase of fibrin in the blood retained. Increase of fibrin favors coagulation. 2. *Slowness or feebleness of blood current;* hence *syncope* (in which the heart is almost at rest)—whether from hemorrhage, or from exhaustion following a long labor, or from sudden reduction of intra-abdominal pressure after rapid delivery, or from previous debility—favors coagulation. Great feebleness of the circulation, *without* syncope, may produce it. 3. *Septic infection* of the blood and accumulation in it of effete matters resulting from involution of uterus, etc. 4. *Excess of fibrin,* common to blood of *pregnant* women. 5. *Thrombi in other veins* may give off fragments (emboli), which lodge in ventricle or pulmonary artery, and constitute nuclei for growth of larger clots by accretion. Several of the above conditions may be combined in lying-in women.

Post-mortem Appearances.—Firm, leathery, laminated, and decolorized clots in right ventricle and pulmonary artery, and its larger branches. Coexistence of thrombi, sometimes, in other veins.

Symptoms.—Sudden occurrence of intense dyspnœa, preceded, or not, by syncope. Extreme pallor, or lividity of face. Violent gasping and respiratory motions, which are short and hurried. Pulse thready, feeble, fluttering, or nearly imperceptible. Skin cool or cold. Intelligence may be unimpaired. Death may occur in a few minutes; or, if obstruction in pulmonary artery be not complete, the symptoms may ameliorate, but return, and repeatedly, when patient attempts the slightest movement. Some live *hours*, some *days*; a *very* few recover. Cardiac murmur may sometimes be heard over site of pulmonary artery.

Diagnosis.—Dyspnœa and asphyxia, with sudden death, may be produced by entrance of air into uterine vessels at placental site—the air having reached the vagina and uterus by use of imperfect syringes, or during manual and instrumental deliveries, or from placing the woman in the genu-pectoral or latero-prone position, or sudden removal of abdominal pressure after violent pains that have expelled liquor amnii may, if vulva gape, produce aspiration of air into vaginal canal. Gases may be produced *in utero*, from decomposition. Symptoms are nearly the same as heart-clot; so is treatment.

Sudden deaths from hemorrhage, shock, uterine rupture, and concealed bleeding from separation of a normally placed placenta, have already been mentioned.

Treatment of Heart-clot.—*Prevent* the accident, when, as after severe hemorrhage, etc., it may be anticipated, by keeping the *head low*, and enjoining *absolute* repose in *recumbent posture*, not permitting the woman to elevate her head *for any purpose whatever*. *Treat* the accident, when it has occurred, by bold administration of *stimulants*—whiskey, brandy, ammonia, etc. Whiskey ʒj, or sulphuric ether ʒj, may be repeatedly injected hypodermically. Fresh air. Milk and beef essence. Absolute and perfect rest. The slightest movement may be fatal. Apply warmth to the surface. Prolonged rest, after subsidence of violent symptoms, until blood is restored by iron, quinine, and food.

PERIPHERAL VENOUS THROMBOSIS.—Clots of blood, forming in the peripheral veins, occur for the most part in the veins of the lower extremity or pelvis (notably in the crural, tibial, or peroneal); and thus, leading to obstruction, produce swelling of the limb; hence peripheral venous thrombosis is the new name for old-fashioned "milk-leg." (Synonyms: "White-leg," "phlegmasia dolens," "œdema lacteum," "crural phlebitis," etc.)

Causes and Pathology.—Not definitely settled. Conditions favoring blood coagulation (just mentioned as productive of *central* thrombosis) act as predisposing causes. The disease is apt to occur after placenta prævia, or after manual extraction of placenta. Coagula from placental site may float into hypogastric veins, and obstruct blood-flow through crural veins. Multiparity; feebleness and debility; difficult and complicated labors; inflammations about the pelvis, following obstetrical operations; hemorrhages; septic infection; cancerous and other pelvic tumors; occurrence of erysipelas, and of puerperal and other fevers during childbed, may be set down as causes.

The disease may occur after abortion (especially when some part of the placenta has been retained), and sometimes it begins independently of both abortion and labor.

Formation of blood-clots (thrombi) in the affected venous trunk is, at present, most generally admitted as the starting-point of the local phenomena, though various other theories severally regard the venous obstruction as being secondary to phlebitis, cellulitis, lymphangitis, etc.

Symptoms.—Usually begin within one, two, or three weeks after labor. Premonitory *malaise*, depressed spirits, weakness, and irritability of temper. *Pain* in the limb, perhaps first referred to the hip-joint, or inguinal region, and then extending to thigh and leg; or may begin in the ankle or calf of the leg, and extend upward. It is a dull dragging pain, increased by motion. Chill followed by fever. Arrest of milk and lochial secretions; the lochia, if present, are offensive. Pulse may reach 120; temperature 101° or 102°, with evening exacerbation. Tongue coated. Bowels constipated. Restlessness; sleeplessness; thirst. Chill, fever, etc., may be absent in mild cases.

Within twenty-four hours limb begins to *swell;* swelling increases until skin is tense, white, and shining, from œdematous accumulation of effused serum in the cellular tissue. Complete *loss of power* in the leg, the patient being unable to turn it over in bed. Some *loss of sensation* in it, a "wooden" feeling. Its temperature increased. Affected vein, or veins, may be felt as thick hard cords, rolling under finger, red and tender. On the inside of thigh the femoral sheath feels as large as a walking-stick; a red flush, and tenderness on pressure, mark its course. Glands of groin may be swollen, inflamed, and hard. Vulva also œdematous.

In a week or two both local and general symptoms abate.

Swelling diminishes by absorption of effused serum, ending in recovery. Other cases terminate in suppuration and abscesses in the limb, pelvis, or lymphatic glands of groin. Rarely, gangrene occurs. Floating fragments of thrombus may lodge in distant parts, producing metastatic abscesses in lungs, liver, joints, etc., with pyæmia, septic infection, and death.

In cases of recovery, some swelling, impairment of motion, and liability to relapse, may continue for weeks or months.

Prognosis.—A fatal termination is exceptional. It is to be feared in pyæmic cases, and in those attended with suppuration of the limb. *Complete* recovery, as regards the limb itself may be long delayed, owing to partial or complete occlusion of venous trunk, and its conversion into a fibrous cord.

Treatment.—Perfect rest and slight elevation of the limb. Swathe it in flannel wet with hot water, and cover flannel with oiled silk, or apply hot flaxseed meal poultice constantly, together with turpentine, laudanum, or belladonna, to relieve pain. Leeches and blisters are recommended, but are best omitted. *Rest* and *moist warmth* are all-sufficient for acute stage.

Local treatment after subsidence of acute symptoms consists in application of dry flannel bandages in place of poultices. Rest and elevation of limb to be continued until affected veins are entirely restored. Gentle, *very* gentle, frictions with stimulating liniments, or iodine, may be used to promote absorption, with caution *not* to disturb thrombus and cause it to float away to some more dangerous locality. Douches of salt water, etc., and an elastic stocking may be of service.

General Treatment.—Avoid depletion. The disease is one of weakness rather than strength. Morphia hypodermically, or Dover's powder internally, to relieve pain. *Food:* liquid nourishing diet of milk, soup, beef tea, etc. Alcoholic stimulants may be necessary. Quinine, tinct. fe. chlorid., and bitter tonics are of service, but alkalies and other medicines given with a view to dissolve the clot, have not been proved to be efficient. The patient should on no account leave her bed until the thrombus has entirely disappeared, and the vein become restored. Should she do so, it would endanger sudden death, from thrombus plugging pulmonary artery, after displacement.

ARTERIAL THROMBOSIS AND EMBOLISM.—Very rarely, clots (thrombi) form in the *arteries* of puerperal women, instead of, or as well as, in the veins. They may also result from the breaking up of a venous thrombus, the fragments of which pass through the heart, and go on in the arterial system until arrested by some artery too small to let them pass. Such arrested floating fragments of a thrombus are called "emboli." Arrested detached fragments of "vegetations" from cardiac valves, following rheumatic endocarditis, sometimes occur.

Symptoms depend chiefly upon defect or arrest of function and nutrition of the particular organ, or part, whose artery has been obstructed by the clot. Paralysis and aphasia result from plugging of cerebral arteries, and blindness from obstruction in the ophthalmic. When the brachial or femoral arteries are the seat of thrombi, the respective limbs below the obstruction suffer a reduction of temperature, loss of motion and of sensation, or, instead of this last, severe neuralgic pain. Pulsation in the artery is lost *below* the obstruction and strengthened *above* it. Gangrene may occur when the collateral circulation is inadequate to sustain nutrition of the limb.

Treatment.—Rest and good diet, with perhaps stimulants, and anodynes to relieve pain. In time, the obstructing body will disintegrate or undergo absorption, but no treatment of which we are aware can hasten these processes. Gangrene belongs to surgery.

CHAPTER XXXV.

INSANITY DURING GESTATION, LACTATION, AND THE PUERPERAL STATE.

THE old term *puerperal mania,* inasmuch as it implies simple *mania,* and only during the puerperal period, is becoming obsolete. Viewed more comprehensively, mental derangements in the female having a casual relation with reproduction may be classified, chronologically, as follows:

1. Insanity of pregnancy.
2. Insanity of the puerperal state.

3. Insanity of lactation.

These, it is evident, may overlap each other, or occur successively in the same patient.

The insanity, at whichever period it occurs, presents one of two special, and to some extent opposite, phases, viz., *mania* and *melancholia*. Both are sometimes combined.

Mania is characterized by paroxysmal violence, mental fury, raving, etc. *Melancholia* means continued despondency, steady gloom, quiet depression, suspicion, mistrust, etc. The mental atmosphere in *melancholia* is steadily dark from impending clouds; in *mania* it is violently agitated as from a cataclysmic storm.

Causes.—The three varieties of insanity have certain causes in common, viz., hereditary predisposition; primiparity after 30 years of age; preëxistence of insanity, epilepsy, hysteria, dipsomania, and other neuroses are predisposing causes. During *pregnancy*, constipation, indigestion, mental worry from accidental circumstances adding to the depression and despondency common to pregnant women, as, *e. g.*, seduction, desertion, etc., contribute to produce the disease. *Special* causes of insanity during the *puerperal* period are: difficult, painful, prolonged, and complicated labors; post-partal hemorrhage; eclampsic convulsions; exhaustion and debility, as from over-frequent childbearing, from lactation during pregnancy, or from previous disease. Violent mental emotion, as fright, shame, sorrow, etc. Septic infection and albuminuria with uræmic contamination of the blood are *probably* (?) additional causes. The insanity of *lactation* is essentially a disease of debility and anemia, these conditions arising from prolonged lactation, frequent childbearing, post-partal hemorrhage, or other causes of exhaustion. An ill-nourished brain cannot perform its normal functions.

Symptoms.—The insanity of *pregnancy* commonly begins about the third or fourth month, or from then to the seventh, rarely later. Symptoms follow the *melancholic* type, and are sometimes exaggerations of previously existing mental, moral, and emotional disturbances, usually noticed as *signs* of gestation. There are headache, insomnia, gloominess, or irritability of temper, personal dislikes, etc., with tendency to suicide. Cure before delivery is exceptional, and there is liability to mania during or after labor.

The insanity of the *puerperal period* is most frequently, but not always, of the *maniacal* type. In very painful labors, when the head is just passing the os uteri, or perineum, a *temporary* frenzy, or "delirium of agony," is sometimes suddenly developed, but *soon passes away*. This is *not* the kind of mania now under consideration. Puerperal mania *proper* begins usually within two weeks after delivery. It may be a week or two later. Sometimes it comes on within a few hours, rarely in a few minutes, after labor. It may or may not be preceded by premonitory symptoms, such as restlessness, headache, insomnia, or sleep disturbed by painful dreams, manifestations of suspicion and dislike toward relatives and attendants, etc.; soon followed by incoherent talking, probably upon amatory, obscene, or religious topics. Patient steadily refuses to take food, and, as excitement increases, refuses to stay in bed, tears off her clothing, screams, prays, attempts self-mutilation or suicide, or to inflict injury upon others. In time, the paroxysm of mental excitement sobers down to melancholy, but fresh outbreaks are liable to occur on slight provocation. During excitement, the pulse is accelerated and small. The digestive system is usually at fault, as shown by furred and coated tongue, and constipated bowels. The urine is high colored, and often passes involuntarily; there may also be involuntary stools.

When *mania* is absent, the *melancholia* symptoms are: persistent refusal to take food; insomnia; intense depression; religious or other delusions; weeping; praying; gloomy silence; tendency to suicide, infanticide, etc. Signs of digestive derangement.

The insanity of *lactation* is generally of the melancholic type, but may be associated with transient mania. It is much more common than insanity of pregnancy; less so than that of the puerperal period. Is usually attended with symptoms of *anemia*. May degenerate into dementia and hopeless insanity.

Prognosis.—As to *life*, the *puerperal* form, usually favorable, but not always. Extreme frequency of pulse, elevation of temperature, and coexistence of pelvic or other inflammations, are of grave significance. Mania is more dangerous to life than melancholia. The prognosis, as to restoration of reason, is less favorable in melancholia. In this respect, also, previous existence of insanity, or its coming on during lactation, or during latter half of pregnancy, are unfavorable, though not invariably so. Insanity coming on *early* in pregnancy and constituting simply exaggeration of usual mental eccentricity of gestation is less serious.

Sometimes weeks or months pass before a cure is effected.

There are no special post-mortem appearances other than those of anemia or coexisting inflammations.

Treatment.—The transient frenzy of acute suffering during delivery is relieved by anæsthesia.

True insanity, at whichever of the three periods it occurs, and whether of the maniacal or melancholic type, requires remedies addressed to *general condition* of patient, rather than to mental symptoms. No depletion is called for; but, on the contrary, *food, rest, sleep,* and *strengthening medicines.*

At the outset give a *laxative,* mild or stronger, according to strength of patient and previous constipation, but always with caution as to reduction of strength by excessive purging. After its operation, secure sleep by bromide of potassium (ʒss every eight hours); or, if this be inefficient, give, with each dose, hydrate of chloral gr. xx. Thirty grains of chloral with sixty of the bromide may be given by enema, if patient refuse to swallow. Opium and morphia are, on the whole, objectionable—certainly so in mania cases; the latter may be given hypodermically in melancholia.

Feed the patient with solid meats, if she will take them. If not, give beef-tea and as much *milk* as possible. The latter will sometimes be accepted as a drink, when the patient declines to *eat,* especially when brought in an earthen instead of a glass vessel, and in a darkened room. Cold to the head, warm pediluvia, a bath of 90° F., or the hot, wet pack for refractory patients, assist in promoting sleep.

Good nursing is of great importance. Every patient should be constantly watched—to prevent self-injury—but without her being aware of it, if possible. Strangers are more acceptable to most patients than husbands, relatives, and friends. The bladder and rectum require special care to secure their being regularly evacuated at proper intervals. Beware of bedsores. Great tact necessary, by firm yet gentle persuasion, to induce the woman to take food. Its artificial administration by force, seldom advisable, though sometimes necessary. The room should be quiet and dark. The woman must not nurse her child.

Insanity coming on during lactation *always* requires immediate weaning of the child, and in addition to food, sleep, etc., iron and quinine are necessary to restore the blood.

The propriety of sending patient to asylum depends much on facilities for good nursing at home. When the latter are wanting, an asylum is demanded. Mania, being of shorter duration than melancholia, and less likely to be followed by confirmed dementia, may be managed at home in most instances. In chronic melancholia, sending the patient to an asylum should not be unduly postponed.

During convalescence, avoid all sources of mental excitement. Continue careful feeding, sleeping medicines at night, laxatives and tonics until strength is fully restored, when change of scene and cheerful surroundings complete the cure.

CHAPTER XXXVI.

INFLAMMATION AND ABSCESS OF THE BREAST—LACTATION AND WEANING.

INFLAMMATION OF THE BREASTS (MAMMITIS, MASTITIS).—Inflammation may attack the *substance of the mammary gland* itself ("glandular mastitis"), or the layer of cellular connective tissue lying underneath the gland, between it and the pectoralis major muscle ("subglandular mastitis," or, more properly, submammary cellulitis). A more circumscribed form of inflammation occurs in the subcutaneous tissue immediately beneath the areola of the nipple (subcutaneous mastitis).

Either variety of inflammation *may* terminate in resolution without suppuration taking place; but in every case an opposite termination is to be feared, viz., the formation of pus, and consequent "mammary abscess" ("gathered breast").

In "*glandular mastitis*" the inflammation and suppuration (when the latter occurs) are usually confined to one lobule, or to two contiguous lobules, of the gland; but, when the abscess has discharged its contents, the inflammatory and suppurative processes may go on to the next adjoining lobule, and so on to another and another, until a greater part of the gland is destroyed by this succession of abscesses, the woman becoming meanwhile seriously, or even dangerously, debilitated by continued suffering and exhausting purulent discharges.

In *submammary cellulitis* inflammation is more diffuse—not confined to the vicinity of any particular lobe of the gland; and, when pus forms, it is apt to infiltrate itself between the gland and chest-wall, separating the one from the other, or leading to long, sinuous tracts, which eventually form fistulous openings, through which matter is discharged. In neglected cases the fistulous orifices may enlarge by sloughing of their borders into ulcerated surfaces of considerable size. In one such case I was able, by lifting the gland away from the chest-wall, to look in at one fistulous ulcer and see daylight admitted through others on the opposite side.

This form of inflammation may begin *de novo*, as a cellulitis, or the latter may be associated with, or produced by, inflammation of the gland itself, the glandular abscess, when deep-seated, discharging its pus posteriorly into the cellular tissue lying beneath the gland. It is not of frequent occurrence.

The "*subcutaneous*" form of mastitis usually terminates in suppuration, forming small abscesses, or boils, in the vicinity of the areola, their openings sometimes forming fistulous communication with the milk ducts.

Causes of Mammary Inflammation.—The most common cause is continued distention of the gland from accumulation of milk, especially when the latter is associated with eroded or fissured nipples, which render suckling extremely painful. Other causes are: sudden depressing emotions; exposure to cold; mechanical injury, as from pressure of clothing, blows, etc. Women who have once suffered from mammary abscess, are likely to do so at succeeding deliveries, probably because adhesions and contractions of previous inflammation have produced obstruction in some of the lactiferous ducts.

Symptoms.—Inflammation of the breast, of either variety, may or may not be preceded by excoriation or fissures of the nipple. So, too, a lump may form in some part of the gland from accumulation of milk, and be attended with some slight tenderness on pressure, but yet be dissipated, under proper treatment, without inflammation taking place. Such an indurated nodule, however, is never safe from superadded inflammation upon very slight provocation. When the inflammatory process really begins, the symptoms are: Chill, fever, rise of temperature, hot skin, frequent pulse, headache, thirst, anorexia, etc.

Locally, lancinating pain in the breast, increased by pressure; increased hardness, heat, swelling, and, at first, very slight redness.

Should the case terminate in resolution, the symptoms gradually disappear in a few days. When it goes on to suppuration, both local and general symptoms increase in severity. There are constant throbbing pain, increased tenderness and swelling, decided redness and heat of skin over the inflamed part, which also appears glazed, shining, and œdematous. The hard lump has now become soft and fluctuating; the latter, however, by no means distinct at first, or when the abscess is small or deep-seated. The fever is continuous, but liable to exacerbations following slight rigors, occurring several times a day. If left alone, the pus eventually makes its way to the surface, the abscess bursts, and is discharged, greatly relieving the pain and tension; and either recovery soon follows, or subsequent renewed attacks develop later, as before described.

Inflammation *without* abscess occurs most often within the first week after delivery. Inflammation *with* abscess is more frequently a later occurrence, coming on in three or four weeks after labor, or, again, the acute symptoms of inflammation may apparently disappear, leaving only a feeling of weight, with some pain and tenderness, and yet suppuration may occur, even after several months.

The symptoms now described occur, varying in degree with the extent of inflammation, in each variety of mammitis. When, however, the subglandular cellular tissue is inflamed, a few of the symptoms are considerably modified; thus the whole breast is swollen and tender, instead of there being one special point of tenderness, and every motion of the arm produces extreme pain, owing to movement of the chest muscles underneath the gland. The pus is slow in coming to the surface; may accumulate in large quantities before doing so, and lead to severe constitutional disturbance and numerous fistulæ and sloughing ulcerations.

In protracted cases of either form of inflammation, accompanied with profuse and prolonged purulent discharge, symptoms of prolonged exhaustion and debility may ensue.

Mammary abscess usually affects one breast only, though sometimes both. The secreting function of the diseased gland, though not at first necessarily arrested (for the healthy lobules continue their secretion), is eventually lost from the necessity of withholding the child from suckling the inflamed breast. When, however, the inflammation has been only slight, and the abscess small, lactation may often be resumed after convalescence.

Treatment.—In the very beginning try to get rid of inflammation without suppuration taking place. In each variety of the disease enjoin rest in bed, with rest of the inflamed organ by not allowing the child to suckle from it. Keep down the secretion of milk by saline cathartics and abstinence from fluids. Three or four leeches may be applied in the neighborhood of the inflamed part, bleeding from their bites being afterwards encouraged by warm fomentations. Leeches are of value only when applied early, and appear to be of greater service in proportion as the inflammation is not deep-seated. Tincture of belladonna added to the fomentation, or the extract (ʒj) mixed with olive oil (℥j) smeared over the breast, both relieves pain and lessens the lacteal secretion. The inflamed breast must be supported, by a handkerchief or sling, from hanging down, especially towards the axilla.

Internally the woman will require opiates to relieve pain, quinia to control temperature, and a diaphoretic mixture (℞ Liq. ammon. acet. ℥ss, with spts. æth. nit. ʒss, every two hours) to promote elimination of fluid from the skin.

Instead of leeches and warm fomentations, the lead and opium wash (℞. Plumbi acetas, ʒij ; extract. opii, gr. xvj ; aquæ, Oj) may be kept constantly applied on flannel or patent lint, covered with oiled silk to prevent evaporation.

Painting the breast with tincture of iodine during the first twenty-four hours has been highly recommended as an abortive measure.

The novel plan, recently recommended by Dr. Corson, of applying *ice-bags* to prevent suppuration and reduce inflammation, consists in keeping constantly over the inflamed breast a bladder or thin rubber bag, filled with cracked ice. A limited trial of this plan has so far given me good results. Even after using warm applications, I have discarded them and *at once substituted* cracked ice, not only without injury, but with decided relief to the patient and improvement in the local symptoms.

In cases where accumulation of milk in the inflamed breast is *very* great, and not relieved by the remedies given, it may be necessary to mitigate the tension by gentle expression with the hand, previously anointed with camphorated oil; but, on the whole, breast pumps, suckling, and manipulation, are not generally advisable, on account of the irritation they produce. The child may generally be allowed to suckle from the healthy breast, but when the mother is much reduced in strength, or when suckling the one appears to keep up engorgement in the other inflamed side, the child should be weaned altogether, with a possibility of lactation being resumed after recovery.

When symptoms of suppuration begin, the local treatment consists in applying hot poultices of flaxseed meal until fluctuation can be detected, when the abscess must be opened without delay. In subglandular cellulitis, the point of opening must be at the lower margin of the base of the gland. An aspirating needle may be required to detect pus accumulation *early* in these cases, before the incision is made.

In other cases, incise over the most soft and prominent portion of the abscess, the incision radiating from the nipple so as to avoid cross-cutting of the milk ducts. The breast should be first cleansed and anointed with carbolized oil, and, after the incision, treated with antiseptic gauze, drainage tube, oiled silk, and a wide bandage, cushioned inside with oakum, so as to make uniform moderate pressure upon the inflamed organ. A strip of carbolized lint, or drainage tube, must be kept in the opening to prevent union, for a few days, or until the discharge has become insignificant in quantity. Long sinuous tracts and fistulæ may require antiseptic injections and drainage; or their walls may be stimulated to healthy granulation, by an occasional injection of nitrate of silver, or sulphate of copper, as in ordinary surgical wounds.

In old neglected cases, timidly treated by small incisions, the patient should be anæsthetized with sulphuric ether, the incision enlarged enough to admit a finger, which may then be passed in to break up the dividing partitions of the several abscesses and convert them into one large cavity, which should be at once irrigated with carbolic acid solution (ʒij to water Oj), and then treated with drainage tube and antiseptic dressing.

When acute symptoms have subsided, leaving the breast stiff, red, and unevenly indurated, with weeping fistulæ, paint with *tincture of iodine* and apply systematic *compression* with adhesive plasters, leaving small apertures opposite the fistules.

In every case of considerable duration, good food, iron, quinine and bitter tonics, will be necessary to prevent debility and exhaustion.

LACTATION AND WEANING.—No arbitrary rule can be laid down suitable for all cases, as to the length of time a woman should nurse her child. About one year is the average time at which weaning may take place. Many mothers nurse their children longer. With savages lactation is often continued several years, or until the advent of another child. With many delicate and sensitive women in the higher walks of life it is impossible to continue lactation beyond a few months, and many of those who persist in prolonging lactation beyond a year, suffer, in consequence, from anemia, menorrhagia, and permanent impairment of their capacity for lactation, as is demonstrated when future children are born to them.

Besides a general incapacity for producing milk, without exhaustion, there are certain conditions which should prohibit a mother from nursing her child. These are: a strong hereditary tendency to cancer, scrofula, and insanity; constitutional syphilis; great emotional excitability. A violent fit of anger has rendered the lacteal secretion sufficiently poisonous to produce convulsions in the child. Lesser, but more constant, degrees of emotional excitement produce deterioration of the milk to an extent which may still be injurious.

The return of menstruation, and the recurrence of pregnancy, during lactation, usually change the milk and make it unfit for the child. Exceptionally, this is *not* the case. Some pregnant and menstruating females continue to secrete milk that agrees with the child. The health of the infant will indicate to which class the mother belongs.

When from any reason the woman is not able to nurse, the infant must either be fed by hand or supplied with a wet-nurse, the latter course being always preferable when it is practicable. In selecting a wet-nurse it should be ascertained that she is free from all of the impediments to lactation just referred to; that her digestion and appetite are good; that her disposition is cheerful and good-natured; that she is free from eruptions on the skin: has sound gums and teeth and inoffensive breath; and that her own child is healthy and well-nourished. Her breasts and nipples must be normal, and it should be known that fulness of the breasts has not been artificially contrived by permitting milk to accumulate for many hours before the examination. The age of the wet-nurse, where there is room for choice in this particular, should be between 20 and 28 years; and the time of her confinement as nearly as possible coincident with that of the mother whose child she is to nourish. When no wet-nurse can be procured, the child must be artificially fed by hand. Directions for the preparation of its food have been previously given in Chapter XII. (page 156).

CHAPTER XXXVII.

THE JURISPRUDENCE OF MIDWIFERY.

An obstetrician, even when not an acknowledged expert in medico-legal matters, may, from his professional relations with patients or persons implicated in legal trials, be compelled, on the witness-stand, to give evidence of a scientific or *quasi* expert character. Under such circumstances a painful lack of scientific knowledge, often sufficient to defeat the ends of justice, and coupled with corresponding embarrassment on the part of the physician, is not infrequently exhibited in our courts. Hence I have ventured to add, in so far as may comport with the brevity of this work, a few rudimentary remarks upon medico-legal topics of an obstetrical character, which, while treating the subject only superficially, may, perhaps, afford some assistance to the unavowed expert, or confessed *un*-expert medical witness. The works on Medical Jurisprudence, by Dr. Alfred Swaine Taylor, and by the Drs. Beck, are my principal sources of information for what is to follow.

Duration and Unusual Prolongation of Pregnancy.—The average duration of pregnancy is *ten* lunar months (forty weeks—280 days). The moral character of a female, and the legitimacy and consequent hereditary rights of offspring, may depend upon the acknowledged degree to which it is *possible* this normal duration may be prolonged, as when a woman gives birth to a child eleven or twelve months after the death (or continued absence from other cause) of her husband. It is undoubtedly *possible* for pregnancy to be prolonged four, five, six, seven, or even eight weeks beyond the normal period, and the child be born alive.[1] Cases are recorded in Taylor's "Medical Jurisprudence," 5th Amer. ed., pp. 473–481; Playfair's "Midwifery," 2d Amer. ed., pp. 154, 155; Lusk's "Midwifery," 1st ed., pp. 109, 110; Leishman's "Midwifery," 2d Amer. ed., pp. 178–181; Meig's "Treatise on Obstetrics," 3d ed., pp. 228–234; Beck's "Jurisprudence," 11th ed., vol. i. pp. 600–604, etc.

Those who assert such cases to be fabulous and unreliable, may be answered with the statement that the same amount of prolongation has been observed in other animals (cows and mares) in which the date of coitus was *positively known*.

The possible unlimited retention of the child in certain cases of extrauterine gestation must be remembered in relation with the duration of pregnancy, in so far as it may affect the character of the woman. The child, after full term in such cases, always dies.

Children born after over-long pregnancies may be overlarge, but are not always so.

THE AGE OF MATERNITY.—Social laws, in most places, restrict very early maternity, but in oriental countries, where marriage is permitted earlier, girls become mothers at ten or twelve years of age. Such cases occur, rarely, in other climates. Three cases: one at eleven years, one at twelve, and one at thirteen, well authenticated, are recorded in Barnes's "System of Obstetric Medicine and Surgery" (1st Amer. ed., p. 241), in Great Britain. In one case, the girl began to menstruate while a child twelve months old, and also had enlarged breasts, with growth of hair upon the pubes and in the axillæ. She was delivered of a child weighing seven pounds, before she was ten years old. (London "Lancet," 1881.)

As to the *latest* age at which a woman may bear a child, a few cases have been recorded at the age of fifty-one and fifty-two years (by Dr. Fordyce Barker, in Philadelphia "Medical Times," 1874), and one at the age of fifty-five years, by Dr.

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[1] A child may die near full term (after symptoms of labor have begun and disappeared), and remain *in utero* months and years afterward—so-called "missed labor cases."

Davies, of Hertford, England (London "Medical Gazette," vol. xxxix.). Dr. Barker declares that "the laws of physiology, the experience of mankind, and the decisions of courts of law, justify a medical man in declaring that a woman *over fifty-five years* of age is past the period of childbearing."

Though it is rare for women to bear children after the cessation of the menses at the "change of life," it is *possible* for them to do so, as rare cases occasionally demonstrate.

SHORT PREGNANCIES WITH LIVING CHILDREN.—A living child, and one that continues to live, being born nine, seven, eight, six, or five lunar months after marriage, may be the cause of suspected pre-marital inchastity on the part of the mother, and possibly of alleged ground of divorce by the husband, together with other legal and social complications. The child is undoubtedly viable at the end of the seventh lunar month. Exceptionally, children born at the sixth month have lived and been *reared*. Cases are even recorded where the infant survived a *short time* when born at the fifth, or even at the fourth month. (See Playfair's "Midwifery," 2d Amer. ed., p. 229; Beck's "Medical Jurisprudence," 11th ed., vol. i. pp. 599, 600, also p. 388; Meadow's "Manual of Midwifery," 4th Amer. ed., pp. 93, 94; Taylor's "Medical Jurisprudence, 5th Amer. ed., pp. 468–471.) The *possibility* of exceptional cases must always be remembered and stated. It should, moreover, be borne in mind that an error of a month may occur, depending upon the selected method of dating the *beginning* of the pregnancy—*i. e.*, whether from the last menstruation, or from the first *omitted* menstruation (see page 62).

APPEARANCES OF FŒTUS AT DIFFERENT PERIODS OF GESTATION.—A medical witness may be asked to express an opinion as to the *probable* duration of a given pregnancy, from the appearance of the child. He cannot be *positive* or exact.

During first month.[1]—*Fœtus* a semi-transparent, grayish, gelatinous mass, about *one-twelfth of an inch* in length, with no definite structure, head, or extremities. Pedicle of umbilical vesicle can be traced into unclosed abdominal cavity.

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[1] The text here refers to *calendar* months. I find no records of appearances at different *lunar* months.

Toward end of first month appearances more nearly resemble those of—

Second month.—Fœtus, at *commencement* of second month, about *half an inch* in length. Body weighs about 60 grains, is curved on itself; convex behind, concave in front. Head just distinguishable. No extremities. Eyes represented by two dark dots; the mouth by a cleft. Chorion formed and covered *on all parts* with villi.

Toward *end* of second month. Body *one*, or *one and a half* inches long. Head and extremities distinctly visible. Upper extremities appear first. Umbilical cord distinct, but untwisted (straight), and inserted into lower part of abdomen. Chorion distinct from amnion. Formation of placenta beginning.

Third month.—Body grows to length of 2, 2½, and by end of month to 3 or even 3½ inches. Fingers and toes formed, but are webbed. Head large compared with body. Nose, ears, anus, and mouth formed—the two last-named being closed. Eyes prominent; lids joined together. Pupillary membrane visible. Umbilical vesicle and allantois have disappeared. Chorial villi atrophied. Placenta separate and distinctly formed. Genitals visible.

Fourth month.—Body grows from 3½ to 5½ or 6 inches in length by end of month. Weight from 3 to 5 or 6 ounces. Sex distinguishable. Mouth and anus open. Nails begin to appear. Chorion and amnion in contact with each other.

Fifth month.—Body grows from 5½ or 6 to 9 or 10 inches in length by end of month.[1] Weight increases from 6 to 10 ounces. Head one-third the length of whole fœtus. Hair and nails visible.

Sixth month.—Length 11 or 12 inches. Weight one pound. Hair distinct; also eyelashes. Eyelids still agglutinated, and pupils still closed by pupillary membrane. Clitoris prominent. Testicles still in abdomen.

Seventh month.—Length about 14 inches. Weight 3 or 4 pounds. Eyelids open. Pupillary membranes disappearing. Sebaceous matter on skin. Nails distinctly formed. Testicles descending, or descended, into scrotum.

Eighth month.—Length about 16 inches. Weight 4 or 5 pounds. Pupillary membranes gone. Nails reach to ends of fingers. Testicles in scrotum. Sebaceous matter on skin more plentiful.

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[1] For this, and the succeeding calendar months, allowing two inches for each month will give a rough approximate average of the child's length: 6th, 12; 7th, 14; etc.

Ninth month.—Length 18 or 20 inches. Average weight 6 to 8 pounds. Males usually larger than females. Nails horny, and reach beyond finger-ends; those of toes not so long. Meconium in rectum. Hair more or less abundant. Umbilicus placed midway between head and feet; but to this there are numerous exceptions.[1]

CASES IN WHICH A WOMAN MAY BE UNJUSTLY SUSPECTED OF CONJUGAL INFIDELITY.—Delivery of a mature or premature child having taken place, the woman (without having meanwhile seen her husband, and without having again submitted to coitus) may, in the course of one, two, or three months, be delivered of another child, which may be either mature or premature. Such cases are susceptible of explanation in three ways:

First. In twin pregnancies one child may be expelled and the other follow only after several weeks or months. (For cases, see Taylor's "Medical Jurisprudence," pp. 486–489; Ramsbotham's "Obstetrics," p. 468; Leishman's "Midwifery," p. 193; Churchill's "Midwifery," American edition, 1866, pp. 177, 178, etc.)

Second. The woman may have a double (bi-lobed) uterus, in each side of which is a fœtus, the two uterine cavities expelling their contents at different times. (For cases, see Playfair's "Midwifery," pp. 58 and 161; Leishman's "Midwifery," pp. 188, 189; Taylor's "Jurisprudence," p. 488; Churchill's "Midwifery," p. 178.)

Third. A pregnant woman submitting to coitus during the early months of gestation may have a second ovule impregnated (super-fœtation), perhaps, just prior to the subsequent death or departure of her husband. The two fœtuses may be born at different times. (For cases, see Taylor's "Jurisprudence," p. 487; Leishman's "Midwifery," pp. 186–188; Playfair's "Midwifery," pp. 161, 162; Churchill's "Midwifery," pp. 177, 178.) The occurrence of super-fœtation has been questioned, but its possibility, and its actual occurrence as a matter of fact, are now generally admitted.

When the two children are of different race or color—one white, the other black—("super-fecundation") the fidelity of the female may be justly questioned.

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[1] It will be observed that only the *external* appearances of the fœtus have been mentioned.

Finally, a woman may expel a child from the uterus in the usual way, and still remain pregnant, even for years afterward, owing to the retained fœtus of a coexisting extra-uterine pregnancy.

TRUE AND FALSE MOLES.—The diagnosis of bodies expelled from the genital canal, not due to impregnation, from those necessarily the result of coitus, has been already sufficiently considered. (See "Hydatiform Pregnancies," p. 132, and "Moles," p. 132.)

DIAGNOSIS OF PREGNANCY.—(See pp. 82–99.)

SIGNS OF RECENT ABORTION IN THE LIVING.—When the fœtus and its membranes, in a case of suspected abortion, are concealed, a medical witness may be required to give evidence as to existing signs of recent abortion in the female. Abortion during the first three months of pregnancy may, even so soon as twenty-four hours after delivery, leave *no proofs whatever* of its occurrence, in the living woman, that can be recognized by examination.

The ordinary signs—at best ambiguous—viz., dilatation of the os uteri with some lochial (bloody) discharge therefrom, enlargement of the uterus, swelling and relaxation of the vulva and vaginal orifice, enlargement of the breasts, secretion of milk, presence of darkened areola round the nipple, etc.—may either be wanting, or, on the other hand, result from other causes.

SIGNS OF RECENT ABORTION IN THE DEAD.—Even the *post-mortem* signs of abortion during the first three months of pregnancy, may so completely disappear in the course of a few days after delivery, as to leave no positive evidence. Satisfactory proofs may, however, be obtained, if examination be made within forty-eight hours after expulsion of the ovum. Then we find usually some enlargement of the uterus, both of its cavity and walls, the latter being thicker and with larger bloodvessels than in a *normal* and unimpregnated state. Cavity of womb may (?) contain remnants of blood-clots, membranes, or placenta. The internal aspect of the uterus may exhibit, after and during latter part of third month, the placental site—a darkened and rough surface. Fallopian tubes and ovaries of deep color from physiological congestion of pregnancy. True corpus luteum in ovary. *Caution:* even these evidences of early abortion—however soon after delivery—can scarcely be more than *presumptive.* Menstruation and uterine diseases require to be excluded (often very difficult) before certainty can be attained. The value of the corpus luteum is considered more at length below.

SIGNS OF RECENT DELIVERY DURING LATER MONTHS AND AT FULL TERM IN THE LIVING AND IN THE DEAD.—Symptoms in the *living* are: Woman more or less weak and incapable of exertion. (Exceptions possible, especially with women in lower walks of life, and among negresses, Indians, and savages. For cases, see Beck, vol. i. pp. 376, 377.) Slight pallor of face; eyes a little sunken and surrounded by darkened rings, and a whiteness of skin resembling convalescence from disease. The above symptoms often absent after three or four days. Abdomen soft: its skin relaxed, lying in folds, and traversed by whitish shining lines (*lineæ albicantes*), especially extending from groins and pubes to navel. (Exceptions: these *may* be the result of dropsy, tumors, or a former pregnancy.) Breasts, after first day or two, full, tumid, and secreting milk. (Exceptions: some women secrete no milk after delivery.) Milk may be, or may be alleged to be, result of a previous pregnancy (before the one in question). Detection of colostrum corpuscles in milk shows delivery to be recent. Nipples present characteristic areola, especially "secondary areola," outside the disk. External genitals relaxed and tumefied from passage of child. Uterine globe felt in hypogastric region through walls of abdomen. Os uteri swollen and dilated sufficiently to admit two or more fingers. Lochial discharge: its color varying with interval since delivery; may be distinguished from menses and from leucorrhœa by its characteristic odor, sometimes described as resembling that of "fish oil." Absence, by laceration, of fourchette; but this is persistent after one labor. Os uteri fissured by radiating shallow lacerations or resulting cicatrices; the latter being, of course, permanent. All these signs *may* be wanting, or become so indistinct, in a week or ten days after delivery, as to be unreliable. In other cases they are available for two or even three weeks. Examine as early as possible in all cases.

SIGNS IN THE DEAD.—These may be available two or three weeks after delivery. Not reliable later.

They are: Enlargement, thickening, and softer consistency of the uterus. During *first day or two*, womb will be found seven or eight inches long and four broad:[1] its walls one or one and a half inch thick; section presenting orifices of enlarged bloodvessels. After *one week*, following a full-term labor, womb between five and six inches long (about the "size of two fists"); after *two weeks*, five inches; at *a month* the organ may have contracted to its unimpregnated size. *Uterine cavity*, during first day or two, and perhaps later, contains bloody fluid, or coagula of blood, and pulpy remains of decidua. Placental site presents valvular, semilunar-shaped vascular openings, and looks dark, somewhat resembling gangrene in appearance. Fallopian tubes, round ligaments, and ovaries, purple from congestion. Spot where ovum escaped from the ovary especially vascular. Orbicular muscular fibres around internal openings of Fallopian tubes distinctly visible for one or two weeks. All the above signs become less marked as interval since labor increases. *Ovary* presents true corpus luteum: value of evidence furnished by it variously estimated by authorities. Chief characteristics of "*true*" corpus luteum—the corpus luteum of *pregnancy*—are: its large *size*, long *duration*, its being (usually) *single*, and its having a distinct *cavity* (either empty or filled with coagulated blood), which is either substituted or followed by a stellate radiating, puckered *cicatrix*. Cavity as large as a pea, may remain three or four months after conception. Ovary is enlarged and *prominent* at site of true corpus luteum. True corpus luteum varies greatly in size and duration in different women. During first three months its average size is nearly one inch long by half an inch broad, and during remaining months of entire pregnancy it measures *about* half an inch long, and a little less in width. Getting smaller toward the end of pregnancy, it still remains one-third of an inch in diameter for some days after parturition, and presents a sort of hardened tubercle even a month or more later. *False* corpus luteum (that following menstruation) grows only three weeks, when it measures about half an inch by three-quarters, and then retracts, becoming an insignificant cicatrix by the seventh or eighth week. It is not *prominent*, has no *cavity*, no *radiating cicatrix*, and is associated with *others*, like itself, perhaps in both ovaries.

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[1] When, however, death has occurred from hemorrhage, and there is *no contraction* of the uterus, the organ will be found as a large flattened pouch measuring ten or twelve inches in length.

Evidence of pregnancy derived from corpus luteum is *corroborative* of other signs only: taken by itself, it cannot furnish *positive* proof either way, owing to liability to exceptional variations in its development. It certainly cannot prove *childbirth*, for, after impregnation, fœtus may have been absorbed and ovum may have degenerated into hydatiform mole.

UNCONSCIOUS DELIVERY.—It is easy to imagine criminal cases—*ex. gr.*, infanticide—in which a plea of unconscious delivery might be set up. Medical testimony would, in such instances, be required as to the possibility of its occurrence, in general, and also as to the likelihood of its having taken place in any given case. Women have undoubtedly been delivered unconsciously during sleep and syncope; during the coma of apoplexy, puerperal eclampsia, asphyxia, typhus, and other malignant fevers; also while under the influence of narcotic poisons and anæsthetics, as well as after death. Others have been delivered while at stool, mistaking their sensations for those of defecation (?).

Delivery during *ordinary* sleep very improbable in primiparæ, or in women with small pelves; less so in those with over-large pelves. Examine circumstantial evidence and insist on full statement of facts from woman herself, before admitting unconscious delivery in any particular case. Its possibility, however, is undoubted. (For cases, see Taylor's "Med. Jurisprudence," pp. 417, 418, 419; Beck's "Med. Jurisprudence," pp. 371, 372, 373.)

FEIGNED DELIVERY.—Delivery has been feigned for the purpose of extorting charity, compelling marriage, producing an heir, or disinheriting others, etc. When the woman has (admittedly) *never been pregnant before*, her fraudulent pretensions may be detected (usually, and especially if a *recent* delivery be claimed), by finding breasts unenlarged and presenting no appearance of milk-secretion, or characteristic areola; no lineæ albicantes upon the abdomen; no enlargement or irregularity of the os uteri; no discharge from vagina; a firm, solid, well-contracted, small, and easily movable womb. Compare alleged date of delivery with appearances of child alleged to have been delivered, noting skin, vernix caseosa, umbilical cord, size, hair, etc., of the latter. (For cases, see Beck's "Med. Jurisprudence," pp. 342–355.)

When a pretended delivery has been *preceded by others* (one or more), detection is more difficult. Signs of recent delivery may, or may not, be present. Examine for them. Inquire into any mystery or concealment respecting situation of female before alleged delivery, during alleged pregnancy; also as to her age and fertility, or previous prolonged sterility; also as to age, decrepitude, or impotency of alleged father.

CRIMINAL ABORTION—FŒTICIDE.—A medical witness may be required to state the *natural* causes of abortion, in general, and also his opinion, in particular, as to whether alleged (or proved) existing natural causes did, could, or were likely to produce it, in a given case. Such evidence may be necessary to eliminate *natural* from *criminal* causes, as, for example, when a female having aborted spontaneously, attempts to fix the crime on an innocent person; and in other cases. The *natural* causes: certain fevers, acute inflammations, syphilis, violent mental emotion, etc., have already been mentioned. (See "Abortion," causes of, pp. 122, 123.) An opinion as to the efficacy of one or more of them, in a given case, must depend (1) upon their intensity, location (of inflammation), virulence and malignity (of fever), etc., and (2) upon the nervous irritability, or susceptibility—in fact, *predisposition* to abort—on the part of the patient, especially as to history of previous abortions, and the "abortion-habit."

Medical evidence may be required also as to *accidental* causes in general, and their probable efficacy in given cases. Such causes are: Blows, falls, jarring the body by railroad and street-car accidents, joggling over rough pavements in vehicles, horseback exercise, etc. After blows upon the abdomen, the uterus, as well as the child, may or may not present evidences of contusion, laceration, incision, etc. Examine for them. Bones of child have even been broken and reunited *in utero*. As to the efficacy of accidental causes, the influence of *predisposition* to abort is paramount. Women have been subjected to repeated and prolonged mechanical violence without aborting when *no predisposition* existed. Books teem with cases. (For remarkable ones, see Beck's "Jurisprudence," pp. 490, 491.) On the other hand, women *with* predisposition abort after very slight causes. Predisposition indicated by great emotional excitability, nervous habit, sensitiveness, and anemia; or by plethora, with (previous habitual) profuse menstruation; or by previous existence of other constitutional diseases acting as spontaneous causes of abortion, and by existence of the "abortion-habit."

MEDICAL TESTIMONY AS TO MEDICINAL ABORTIVES AND INSTRUMENTAL METHODS.—Medical witnesses should neglect no opportunity of stating (what are actual facts, viz.) that all these methods are (1) *uncertain* in their operation upon the child; (2) always dangerous and often fatal to the mother; and (3) sometimes fatal to mother without affecting infant. Children have survived and lived after the mother's death where premature delivery has been induced by criminal means.

EMETICS have been given in large doses, and induced violent vomiting without producing abortion. The spasmodic contraction of the abdominal walls and diaphragm accompanying emesis are more dangerous in proportion to greater size and development of the uterus; hence during later months. Fifteen grains of tartar emetic have been taken without interrupting pregnancy (Beck, vol. i. p. 475).

CATHARTICS.—Purging carried too far, continued too long, and when accompanied with tenesmus, as after administration of decided *drastics*, may produce abortion, especially during later months. Cathartics may be given during early months, especially when no *predisposition* exists, without decided effect. Pregnant women attacked with disease may be purged freely without abortion. (Cases: Beck, vol. i. pp. 475, 476.)

DIURETICS.—A drachm of powdered *cantharides* (in one case), and one hundred drops of oil of juniper every morning, for twenty days (in another), have been taken to produce abortion (Beck, vol. ii. pp. 477, 478), but in both instances living children were born at full term. Cantharides, however, has induced miscarriage in some cases (Beck, vol. i. p. 478). These, and such other diuretics, as broom, nitre, fern, etc., exert no specific action on the uterus; and they, together with mineral and *irritant poisons*, such as arsenic, corrosive sublimate, sulphate of copper, etc., can only be considered abortives when they occasion shock, or produce sufficient irritation or inflammation to affect the general system, often at the expense of the woman's life.

JUNIPERUS SABINA is a popular abortive, of undoubted efficacy in some cases, from the consequent irritation or inflammation it induces. It probably has no direct action upon the uterus. It has produced death, and has been taken for criminal purposes in sufficient doses to produce severe gastritis without abortion following. Physicians administering it to women suspected of pregnancy, or without being previously satisfied that pregnancy does not exist, would be fairly open to suspicion of criminality.

SECALE CORNUTUM.—On trials for criminal abortion a medical witness must be prepared for a close examination on the specific emmenagogue properties of this drug (Taylor). Despite differences of opinion on the subject, the latest conclusion, and which seems inevitable, is, that this medicine has a specific action as a direct uterine excitant, even when the uterus is not already in active contraction. Formerly it was supposed to act only when uterine contractions had already begun. Large doses have, however, been taken to produce abortion without effect (see Beck, vol. i. p. 483). Its emmenagogue properties increase as pregnancy advances, and are probably more marked at periods corresponding with the former catamenia. (For numerous references and cases, etc., see Taylor's "Jurisprudence," pp. 433, 434, 435; and Beck, vol. i. pp. 482, 483.)

TANACETUM VULGARE has acquired popularity as an abortive. It possesses no specific action upon the uterus. The oil, in doses of one drachm, four drachms, and eleven drachms, was taken respectively in three cases, each of the women dying in a few hours, without abortion coming on (Taylor, pp. 436, 437).

HEDEOMA PULEGIOIDES and POLYGALA SENEKA are reputed abortives, but of doubtful efficacy. The former is a decided emmenagogue. One case of abortion from its *odor* (?) is reported (Beck, vol. i. p. 481); but I find none due to seneka.

MERCURY.—Crude quicksilver (even in quantities of a pound at once), and medicinal preparations of mercury, continued even until salivation, have been given without producing abortion. Ptyalism from mercury may, however, produce it in those *predisposed.*

BLOODLETTING.—Bleeding, leeching, and cupping, were formerly considered abortives; but there is abundant evidence to the contrary.

INSTRUMENTAL METHODS.—The reader is already familiar with the methods of inducing labor for beneficent purposes, elsewhere considered. Devices somewhat akin to them are resorted to for criminal purposes. In such cases, examine carefully (1) the kind and extent of injury (if any) inflicted upon the uterus (especially the os and cervix) and the child; (2) note by what sort of instrument such injury could have been inflicted; (3) whether it could have been done by the female herself, or implied the interference or assistance of some other person; and (4) whether it indicated anatomical knowledge, or a want of it, on the part of the operator. Instruments *may* be introduced into uterine cavity repeatedly during first three months of pregnancy without disturbing amniotic sac or discharging liquor amnii, and gestation still continue. After rupture of amnion, uterus begins to act in 10, 20, 40, or 60 hours—sometimes not for a week. When contents of uterus are submitted for inspection, be certain whether or not they contain a fœtus, mole, or hydatiform mass. Diagnose ovum in early cases by seeing villi of chorion under microscope, if no fœtus be present. If there be a fœtus, ascertain its probable age (see pp. 348, 349). As to period at which a child *in utero* becomes alive or "quickens," be ready to state that *it is a living being from the time of conception*—as much so at any time during the first month as during the last. The idea of life being imparted to it in any given period during pregnancy is an error, long ago discarded.

CHILD-MURDER AFTER BIRTH—INFANTICIDE.—When a mother is suspected of killing her own child, medical testimony is necessary as to (1) whether she has been delivered of a child; (2) whether signs of delivery agree, as to time, etc., with appearances of child as to maturity, and length of survival after birth. (For signs of delivery, see pages 351–354; and for signs of maturity, pages 348–350.)

INSPECTION OF CHILD'S BODY.—Original notes (made on the spot) to be kept as to the following points:

1. Exact length and weight of body.
2. Peculiar marks or deformities about it.
3. Marks of violence and probable mode of their production.
4. Umbilical cord: whether cut, tied, or torn; its length, and appearance of its divided bloodvessels.
5. Vernix caseosa on groins, axillæ, etc., as indications of washing and other attentions.
6. Odor, color of, and separation of cuticle from skin, as evidence of putrefaction.

DURATION OF SURVIVAL AFTER BIRTH.—Signs uncertain, but great precision not demanded of medical witness. Length of survival for shorter time than twenty-four hours not to be determined by *any* sign. Drying, etc., of navel-string *may* occur in the *dead.* Usual appearances are during—

Second 24 *hours:* Skin less red than during first day. Meconium discharged, but large intestine still contains green-colored mucus. Amount of lung-inflation unreliable, though perfect inflation *indicates* many hours of life. Cord somewhat shrivelled, but still soft and bluish-colored from ligature to skin.

Third 24 *hours:* Skin tinged yellowish, cuticle somewhat cracked, preparatory to desquamation. Cord brown and drying.

Fourth 24 *hours:* Skin more yellow; desquamation of cuticle from chest and abdomen. Cord brownish-red, semi-transparent, flat, and twisted. Skin in contact with it, red. Colon free from green mucus.

Fifth and Sixth 24 *hours:* Cuticle desquamating in various parts in small scales or fine powder. Cord separates fifth day, but may not do so till eighth or tenth. Ductus arteriosus contracted ; foramen ovale partly closed.

Sixth to Twelfth day: Cuticle separating from limbs. If cord was small, umbilicus cicatrized by tenth day ; may not be healed completely till three or four weeks—much depends on the mode in which it has been dressed. Body heavier. Ductus arteriosus entirely closed ; exceptions quite possible.

WAS THE CHILD BORN ALIVE?—This question involves several upon which medical testimony may be required, viz.: (1) Did child *live* (as indicated by pulse, etc.), but *without breathing?* Children may so live for a short period (during which violence may be used), but there are no satisfactory post-mortem medical data to enable a witness to express a positive opinion on this point. Absence of respiration does not prove child to have been born dead, for it may have been drowned (in a bath) or suffocated intentionally at the moment of birth. Marks of violence *may* afford *un*certain proof. Marks of putrefaction *in utero* prove death before birth ; they are, chiefly, flaccidity of body, so that it easily flattens by its own weight; skin reddish-brown—not green; that covering hands and feet is white with cuticle sometimes raised in blisters containing reddish serum. Bones movable and readily separated from soft parts. These appearances occur after child has remained dead *in utero* eight or ten days; scarcely available sooner. (N. B. The skin *may* become greenish when body is long exposed to air.) (2) Did child *breathe as well as live?* (3) If so, did it breathe perfectly, or *imperfectly?* Evidences of child having breathed are—

1st. The Static Test.—The absolute or *actual* weight of the lungs is increased after respiration, owing to greater quantity of blood they contain. Hence 1000 grains have been proposed for average weight of lungs *after* respiration, and 600 grains *before* respiration. Actual weight of child and of its organs varies so much in different individuals as to render this test totally *un*reliable. A second method of its application (Ploucquet's test) is to take the *relative* weight of the lungs as compared with that of the body, before and after respiration. Different observers have obtained the following *average* results :

	Before Respiration.		After Respiration.	
	Lungs.	Body.	Lungs.	Body.
Ploucquet	1 :	70	1 :	35
Schmitt	1 :	52	1 :	42
Chaussier	1 :	49	1 :	39
Devergie	1 :	60	1 :	45
Beck	1 :	47	1 :	40

Hence this test is certainly not infallible, but may furnish *corroborative* proof.

2*d*. *The Hydrostatic Test* (specific gravity of lungs).—Its general principle is, that *before* respiration the lungs *sink* rapidly when placed in water; *after* respiration, they *float* high in that fluid. They may, however, float from other causes, viz., from gases developed in them during putrefaction, from artificial inflation, and from emphysema. In these cases the contained air (or gas) can be forced out of the lungs by compression (to be applied as described below), so that they afterward sink; this cannot be done after *perfect* respiration. Artificial inflation does *not* increase weight of lungs. After *im*perfect respiration (as in feeble children, or those who take only a few gasps) the air *can* be expelled by compression, so that this is not to be distinguished from artificial inflation.

Exceptionally, the lungs may sink after respiration, from congestion, inflammation, and other diseases having increased their weight. Incising the lung and squeezing out its extra blood, or cutting it up and compressing each piece, will generally cause the organ, or some pieces of it, to float, if the child have breathed.

Application of Hydrostatic Test.—Having opened chest, note *position* of lungs (*before* respiration they occupy a small space at upper and posterior parts of thorax); their *volume* (of course increased after breathing); their *shape* (before respiration, borders sharp or pointed; after it rounded); their *color* (before breathing, brownish-red; after it, pale red or pink); their appearance as regards disease and putrefaction; and whether they *crepitate* on pressure (as they will *after* respiration).

Take out lungs, with heart attached, and place them in pure water having temperature of surrounding air. Note whether they float (high or low), or sink (slowly or rapidly). Separate them from the heart; weigh them accurately, and then place them in water again, and note sinking or floating as before. Subject each lung to pressure with the hand, and note sinking or floating again. Cut each lung in pieces and test floating again. Take out each piece, wrap it in a cloth, and compress with fingers as hard as possible, and test floating, etc., as before. The crucial test of *perfect respiration* is each piece floating after the most vigorous compression.

Value of Respiration as Evidence of Live Birth.—Respiration does not *prove* child to have been *born alive*, for it may have breathed (imperfectly at least), and even have been heard to cry in the vagina or uterus[1] before birth was complete, as in face cases, and retained head in breech presentations, etc. Exceptionally a child may live and even breathe (by bromchial respiration only) for hours and even days with partial, and twenty-four hours with actually *complete*, absence of air from the lungs. (Cases: see Taylor, pp. 335, 336, 337; Beck, vol. i. p. 517.) The lungs retain their fœtal condition of atelectasis. That they are not hepatized is proved by their susceptibility to artificial inflation. Physiological explanation of life under such circumstances still wanting. Probably, *complete* absence of air is only apparent instead of real, owing to our means of demonstration being imperfect. Here the hydrostatic test is inapplicable, but the fact does not lessen its value in proving signs of respiration that *do* exist in other cases

EVIDENCE OF LIFE FROM CIRCULATORY ORGANS.—The contracted or open condition of the foramen ovale, ductus arteriosus, and ductus venosus, furnishes no reliable evidence of live birth.

EVIDENCE FROM STOMACH.—The presence of farinaceous or other food in the stomach proves the child to have lived after delivery was complete, at least in the absence of any proof that food was placed in the stomach after death.

NATURAL CAUSES OF DEATH IN NEWBORN CHILDREN, and which, of course, have a direct bearing upon infanticide, are:

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[1] It is said a child has been heard to cry *in utero* weeks before delivery (Taylor, pp. 350, 351; Beck, vol i. pp. 537, 538). On this point one feels disposed to adopt the remark of La Fontaine and Velpeau: "Since learned and credible men have heard it, I will believe it; but I should not believe it if I heard it myself."

Prematurity of birth; congenital disease, or malformation; protracted or difficult delivery; compression of umbilical cord; hemorrhage from the cord or umbilicus. (See pages 157, 190, 307, 311.)

VIOLENT CAUSES OF DEATH IN NEWBORN CHILDREN may be either *accidental* or *criminal.* Death, however, may occur without any *marks* of violence, as from cold, starvation, suffocation, and drowning. In so far as these latter are concerned, an obstetrician may be required to testify as to the newly delivered female having sufficient strength, knowledge, sanity, and presence of mind to take proper care of her child, and prevent those occurrences. In a primipara, when delivered alone, the lack of these conditions may exonerate her from intentional guilt, as when the infant has been proved to have died by resting on its face in a pool of blood, or some other discharge; or when it has been delivered into a vessel containing water, on which the woman was seated, while mistaking her symptoms for those of defecation, etc. The opinion of an obstetrician in these cases, however, must be very guarded, especially with reference to single women and those delivered of illegitimate children. The circumstances attending delivery should first be accurately known, or at least diligently inquired into. The same caution necessary in death, *with* marks of violence, as in fractures of the skull, alleged to have occurred by the child falling during sudden delivery in the erect posture, or by innocent attempts at self-delivery, or attempts made by a midwife or other person. Marks of strangulation round the neck may be mistaken for those due to coiling of the navel-string round the same part, and *vice versa.* In death from coiling of the cord there are no deep marks on, extravasation of blood beneath, nor ruffling or laceration of the skin, nor injury of the deeper-seated parts, as there usually are in homicidal strangulation. In strangled children the lungs have usually been inflated by respiration. In death from coiled cord they retain their fœtal condition. Marks on the neck may, possibly, be made by forcible efforts at self-delivery, or by *cap-strings,*[1] or by bending of the head forcibly toward the neck soon after death, or as an accident of labor. These must be distinguished from homicidal marks.

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[1] *These,* however, have been used for *homicidal* strangulation.

Pale, shallow marks *may* be made by coiling of the navel-string, but they are not accompanied with extravasation, etc.

Fractures of the skull, from the use of instruments during labor, or even from force of uterus without instruments, and from falling of the child when the mother is suddenly delivered while erect, or while sitting in a water-closet, etc., can scarcely be distinguished from fractures or other injury due to criminal violence, except by circumstantial evidence, or by comparing size of child with pelvis in certain cases. The existence or non-existence of puerperal insanity (mania) is an important question in these cases.

MEDICAL EVIDENCE OF RAPE.—Medical evidence in rape is usually only corroborative of circumstantial proof, but may become leading testimony in cases of false accusation, or of brutal attempts upon infants and children.

Medical witnesses, before expressing an opinion as to whether rape have been perpetrated, should first understand the legal definition of rape, as to whether it mean contact, vulvar penetration, vaginal penetration, emission, rupture of the hymen, etc., one or more. The rule laid down in the United States is that "there must be *some* entrance proved of the male within the female organ." That is enough. No matter about emission, etc.

MARKS OF VIOLENCE UPON THE GENITALS are: ecchymosis, contusion, and laceration of the parts, with or without bleeding. Redness, tenderness, heat, and swelling from subsequent inflammation. *All* of these *may* disappear in two or three days after the act. In young children laceration of the perineum and of the vaginal wall, and penetration of the abdominal cavity, with fatal result, have occurred. Note that mechanical injury of the parts may result from other causes. In the absence of additional proof a physician may only be able to state that the injuries are such as *might* be produced by rape. Inflammation, ulceration, and even gangrene of the vulva may also result from disease, as in the vaginitis and vulvitis of young children from worms, scrofula, uncleanly habits, erysipelas, malignant fevers, etc. In these, laceration and dilatation of the parts are absent, while the redness and purulent discharge are usually greater than follow violence.

MARKS OF VIOLENCE UPON THE BODY.—In women previously accustomed to coitus these are important, as evidence of resistance on the part of the female. The genital signs may be wanting. Note exact form, position, and extent of any marks upon the body. If bruises exist, note presence or absence of color zones, indicating *date* of alleged assault.

EXAMINATION OF CLOTHING.—Cut out stained spots from the clothing, whether dry or moist, and pale or colored, place them in a watch-glass with just enough water thoroughly to moisten them for fifteen minutes, then squeeze out a few drops of their contents, and examine, under microscope, for *human* blood corpuscles and spermatozoids of seminal fluid. The evidence thus afforded, it is plain, may or may not be important, according to circumstances. The same may be said of microscopical examination of vaginal mucus for spermatozoa, whether in the living or the dead. Loose fibres of clothing, examined microscopically as to their color and material, may sometimes furnish evidence of importance as to personal contact of persons wearing such clothing.

EXAMINATION FOR VENEREAL DISEASE.—The existence of gonorrhœa or syphilis, either in the male or female, and its conveyance from one to the other, may afford either negative or positive proof *pro re nata.* It should always be inquired into, and the time of its appearance after the alleged coitus, in the person said to have been infected by the other, duly noted.

SIGNS OF VIRGINITY.—The presence of an unruptured hymen affords presumptive, but not absolute, proof that the female is a virgin. The hymen may be congenitally absent, or ruptured from causes other than coitus; and impregnation without vaginal penetration during intercourse, may take place, the hymen remaining intact.

PREGNANCY RESULTING FROM RAPE was formerly thought to be impossible. The contrary is now universally admitted. Conception may or may not occur, as after ordinary intercourse.

IMPOTENCE.—A medical opinion may be required as to sexual capacity, in a male accused of rape, bastardy, etc. Congenital impotence, from defective development of organs, is very rare. It is indicated by the individual being (usually) fat, without hair on the face, and none or but little on the pubes; by his testes and penis remaining small; his voice weak, and of the falsetto quality. There is complete absence of sexual desire, and a general deficiency of virile attributes. The age of puberty varies. It is usually from 14 to 17 years; exceptionally not until 20 or 21. Rape, legally defined to mean "some penetration," has been committed by boys of 13, 12, or even 10 years (Cases in Taylor, p. 500). Procreation, however, is impossible until spermatozoids appear in the seminal fluid. They have been recognized microscopically at the age of 18, but may undoubtedly appear sooner. Boys have become fathers at 14, perhaps earlier (Case of 14, in Taylor, p. 502). The beard, voice, development of the organs, and other marks of virility, should be our guides in any given case, rather than *age* alone.

A few cases are on record where puberty developed between the ages of two and three years. In one case (by Mr. Bruce Clark, "Brit. Med. Journal," Feb. 6, 1886) hair appeared on the pubes at the age of eighteen months, and at four years of age this boy was as large as one at ten or twelve years, the penis being as large as that of a man, with morning erection, but the testicles were small, and there were no evidences of sexual desire or seminal emissions. The perineum and pubes were well supplied with hair, but it was absent in the axillæ.

IMPOTENCE FROM ADVANCED AGE.—Procreative power has been retained till the age of 60, 70, 80, and 90 years. Such individuals usually retain also an extraordinary degree of bodily and mental power. Sexual capacity may be lost much sooner. Age alone cannot define any limit.

IMPOTENCE FROM LOSS OF ORGANS, ETC.—Loss of both testicles *does*, but loss of one does *not*, render a man impotent. Examine for cicatrices, etc., upon scrotum. Even after removal of both, enough spermatic fluid may remain in the ducts during the first two or three weeks, to confer procreative power. Persons in whom one of the testicles remains in the abdomen are not usually impotent. When both testicles remain undescended the individual may or may not be impotent—usually the former—according as the organs are or are not imperfect in their development. Medical opinion is to be based chiefly on signs of virility before stated, and on examination of secretion for spermatozoa.

As to impotence arising from injury of the generative organs, brain, spinal cord, etc., or from general diseases, a medical opinion must rest upon the circumstances attending each case.

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